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Firm Size, Serial and Non-Serial Acquisition, and Stockholder Wealth

Hang Li, Nicholas F. Carline, and Hisham Farag*

Abstract

Acquisitions by larger firms seem to generate less wealth for acquirer stockholders than acquisitions by smaller firms. In this paper, we re-examine the 'size effect', but separately for serial and non-serial acquisition. We find sample-selection bias results in a spurious size effect for non-serial deals, but that it does not affect the size effect for serial deals. Our results suggest this is because smaller non-serial acquirers require greater time-varying synergies than larger non-serial acquirers. In contrast, larger serial acquirers are associated with persistent synergies to a greater extent than smaller serial acquirers. Our findings are consistent with rational managerial behavior.

JEL classification: G34

Keywords: firm size; acquisition; serial acquirer; stockholder wealth; sample-selection bias

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Firm Size, Serial and Non-Serial Acquisition, and Stockholder Wealth

1. Introduction

The efficiency of the market for corporate acquisitions can be impeded by many factors. Acquirer size seems to be an important factor.[1] In a seminal study, Moeller, Schlingemann, and Stulz (2004) find that, overall, acquisitions by larger firms generate significantly less wealth for acquirer stockholders than acquisitions by smaller firms. They attribute the 'size effect' to stockholder expectation that acquisitions by larger firms are more prone to overpayment because of managerial hubris.[2] Other studies suggest a similar line of reasoning to explain why it is that, no matter acquirer size, acquisitions by the same firm, or manager, in relatively close succession (serial deals) successively generate significantly less wealth for acquirer stockholders (see, for example, Moeller, Schlingemann, and Stulz, 2005; Billett and Qian, 2008). That is, serial deals imbue managers with increasing levels of overconfidence, leading them to increasingly overestimate their ability to generate synergies. Furthermore, Karolyi, Liao, and Loureiro (2015) find that, no matter acquirer size, serial deals generate significantly less wealth for acquirer stockholders than non-serial deals. However, they attribute the 'serial effect' less to managerial hubris and more to a pursuit of managerial self-interest.

In this paper, we re-examine the size effect, but separately for serial and non-serial acquisition. The contribution of our study is to explore possible connections between the size

[1] Just how important a factor is acquirer size seems to depend on the extent of political connections and rules governing the use of anti-takeover mechanisms in the country of acquirer jurisdiction (see Humphery-Jenner and Powell, 2011, 2014).

[2] Managerial behavior of this irrational kind is variously labelled as "hubris" (see Roll, 1986), "overconfidence" (see Malmendier and Tate, 2008), and "narcissism" (see Aktas, de Bodt, Bollaert, and Roll, 2016) in the literature on corporate acquisitions. Offenburg (2009) provides post-acquisition evidence to suggest the size effect also manifests from a pursuit of managerial self-interest (for example, power, private benefits of control, and entrenchment). However, although a manager imbued with hubris is less likely to have selfish intentions, the outcome for stockholder wealth is likely to be similar to the case of a self-serving manager.

effect and these different types of acquisition. Central to our study is the question of whether or not the size effect is a spurious result of sample-selection bias. That is, of not taking into account the correlation between acquirer size and unobservable factors jointly affecting acquisition likelihood and the wealth effect for acquirer stockholders. Crucially, by separating serial and non-serial deals, we permit unobservable factors and the correlation to depend on the type of deal. The findings from our study suggest reinterpretations of both the size and serial effects consistent with rational managerial behavior.

We begin by examining whether or not there is a separate size effect for serial and non-serial deals, but without, at this stage, accounting for the possibility of sample-selection bias. For a large sample of acquisitions and firms, and after controlling for a raft of acquirer and deal characteristics (including both absolute and relative deal size), our results reveal that both serial and non-serial deals by larger firms generate significantly less wealth for acquirer stockholders than corresponding deals by smaller firms. However, the size effect is most pronounced for serial deals. Needless to say, and consistent with the finding of Moeller et al. (2004), an overall size effect is also plainly evident when we pool deals.

Next, we address the question of whether or not the size effect is a spurious result of sample-selection bias. Three interrelated conditions are necessary for this to be a possibility.[3] First, firm size needs to jointly affect acquisition likelihood and the wealth effect for acquirer stockholders. If, by virtue of size, larger firms have more financial and operational capacity for acquisition than smaller firms, the size effect results from a sample characterized by more censoring of smaller firms. Second, unobservable factors, like potential synergies and managerial hubris/self-interest, also need to jointly affect acquisition likelihood and the

[3] Certo, Busenbark, Woo, and Semadeni (2016) provide a general appreciation of the necessary interplay between the three conditions. See also Li and Prabhala (2007) for an extensive review of approaches to address sample-selection bias in research on corporate finance. Our study is one of the first to address the question of whether or not the size effect is a spurious result of sample-selection bias.

wealth effect for acquirer stockholders.[4] A positive (negative) joint effect of unobservable factors is more likely indicative of potential synergies (managerial hubris/self-interest) that increase(s) acquisition likelihood and also increase (decreases) the wealth effect for acquirer stockholders.[5] Third, acquirer size needs to be correlated with the joint effect of unobservable factors. A positive (negative) correlation in combination with a positive joint effect of unobservable factors is more likely indicative of larger (smaller) acquirers requiring more potential synergies. Alternatively, a positive (negative) correlation in combination with a negative joint effect of unobservable factors is more likely indicative of larger (smaller) acquirers being more prone to the adverse consequences (overpayment in particular) of managerial hubris/self-interest. Without accounting for the positive (negative) correlation there is potential for downward (upward) bias in the size effect. Moreover, it is possible that both the direction and significance of each condition are different for serial and non-serial deals.

As such, we use sample-selection models (adding relevant control variables and exclusion restrictions to the, first stage, prediction of acquisition likelihood) to examine each of the three conditions separately for serial and non-serial deals. First, our results reveal that larger firms are significantly more likely to become both serial and non-serial acquirers than smaller firms. However, more censoring of smaller firms is most pronounced for firms that become serial acquirers. Second, we observe a positive joint effect of unobservable factors for both serial and non-serial deals. However, the joint effect of unobservable factors, more likely indicative of potential synergies, is only significant for non-serial deals. Third, we find the size effect is only significant for serial deals. The size effect for serial deals is identical to

[4] Although we can proxy for these unobservable factors, the proxies are unlikely to capture all information about potential synergies and all traits of irrational/self-serving managerial behavior. Here, by design, these unobservable factors are time-varying. This is possible, at least in part, because managers can do acquisitions at the helm of different firms.

[5] As explained in the next section, a negative joint effect of unobservable factors is more likely indicative of managerial hubris than a pursuit of managerial self-interest because the UK is the country of acquirer jurisdiction chosen for our study.

that estimated without a sample-selection model. We infer from a no longer significant size effect for non-serial deals that acquirer size and potential synergies are negatively correlated. The negative correlation is to an extent that without a sample-selection model there is significant upward bias in an otherwise non-evident size effect for non-serial deals. Our results highlight a subtle point about sample-selection bias. Although more censoring of smaller firms is a necessary condition to potentially show a spurious size effect, the other conditions are more likely to be significant when there is more moderate censoring of smaller firms.

Interestingly, when we disregard whether firms become serial or non-serial acquirers and only model overall acquisition likelihood, the direction and significance of the necessary conditions to show a spurious size effect are more in line with those for non-serial deals. This is so much so that, with a sample-selection model, the size effect is also no longer evident when we pool deals.[6] We draw the following inferences from our sample-selection results: (1) larger firms have more financial and operational capacity for acquisition, but serial acquisition in particular, than smaller firms; (2) smaller acquirers, but smaller non-serial acquirers in particular, require more potential synergies than larger acquirers. With greater uncertainty associated with being a smaller acquirer, it is rational for smaller acquirers, but smaller non-serial acquirers in particular, to require greater time-varying synergies.

Our sample-selection results are robust to alternative estimates of firm size, the wealth effect for acquirer stockholders, and the joint effect of unobservable factors. In contrast to firm size, our results for the control variables also included in both stages of the sample-selection models reveal scant evidence of significant bias (in the, second stage, determination of the wealth effect for acquirer stockholders) relative to those estimated without sample-

[6] In a parallel study, Austin, Harris, and O'Brien (2017) also find an overall size effect to no longer be evident with a sample-selection model. However, they do not examine the size effect separately for serial and non-serial deals.

selection models. With regard to the serial effect documented in Karolyi et al. (2015), we too find that, no matter acquirer size, serial deals generate significantly less wealth for acquirer stockholders than non-serial deals. Needless to say, because the serial-deal variable has relevance for the determination of the wealth effect for acquirer stockholders, but not for the prediction of acquisition likelihood, the serial effect is significant with or without a sample-selection model.

In the last part of the study, we turn to explore the possibility that the size effect for serial deals is more nuanced. Macias, Rau, and Stouraitis (2016) find serial acquirers have different profiles. In particular, not all serial acquirers have a tendency to do acquisitions in especially close succession (block deals). If smaller firms have relatively less financial and operational capacity for block deals than non-block serial deals, accounting for these different profiles, and the associated rates of more smaller-firm censoring, has the potential to show it is misleading to focus on the overall size effect for serial deals. We therefore use sample-selection models to examine the size effect separately for block and non-block serial deals. Our results reveal that for both profiles the direction and significance of the necessary conditions to show a spurious size effect are similar to when pooling serial deals. Furthermore, we find that, no matter acquirer size, block deals generate insignificantly less wealth for acquirer stockholders than non-block serial deals.

Also, Golubov, Yawson, and Zhang (2015) find persistent factors explain variation in the wealth effect for acquirer stockholders to a greater extent than, observable, time-varying factors (including acquirer size) emphasized in earlier studies of serial deals (see, for example, Fuller, Netter, and Stegemoller, 2002; Klasa and Stegemoller, 2007). If acquirer size is also correlated with persistent factors, without accounting for the positive (negative) correlation there is additional potential for downward (upward) bias in the size effect for serial deals. We therefore add fixed effects for serial acquirers to a sample-selection model to account for

unobservable factors, like potential synergies and managerial hubris/self-interest, in both persistent and time-varying form.[7] Our results reveal that without accounting for both forms of correlation there is significant downward bias in the size effect for serial deals. However, we attribute the bias in full to omitted persistent factors because the joint effect of unobservable, time-varying, factors remains insignificant after adding fixed effects for serial acquirers.

Moreover, by fixating on the average size effect for serial deals, we assume that it is constant in the wealth effect for acquirer stockholders. This is possibly an incorrect assumption, especially given that we suspect larger serial acquirers are associated with persistent factors to a greater extent than smaller serial acquirers. If potential synergies (managerial hubris/self-interest) more likely account(s) for larger serial acquirers being more associated with persistent factors, we expect to observe that the size effect for serial deals is increasing (decreasing) in the wealth effect for acquirer stockholders. We therefore use sample-selection models to simultaneously examine the size effect for serial deals across quartiles of the wealth effect for acquirer stockholders. Our results reveal that the size effect for serial deals is increasing in the wealth effect for acquirer stockholders, and that it is insignificant in the lower quartile consisting only of wealth-destructive deals.[8] We account for this monotonic relationship as more likely resulting from larger serial acquirers being more associated with persistent synergies than smaller serial acquirers. This is possible, at least in part, because the joint effect of unobservable, time-varying, factors is insignificant in all quartiles of the wealth effect for acquirer stockholders.

[7] It is possible for potential synergies and irrational/self-serving managerial behavior to manifest in persistent form, at least in part, because managers can do serial deals either by remaining at the helm of the same firm, or by moving to firms in which these persistent factors already manifest as a result of earlier serial deals.

[8] In another parallel study, Schneider and Spalt (2017) find the size effect is reversed (that is, turns significantly in favor of larger acquirers) for wealth-destructive deals. They suggest that, overall, both wealth destruction and creation is scaled down for larger acquirers. However, our otherwise similar results, together with our earlier findings, suggest an altogether different interpretation of the size effect for serial deals alone.

Our additional findings for the size effect for serial deals are consistent with rational managerial behavior of a kind construed by Hirshleifer and Titman (1990) and Aktas, de Bodt, and Roll (2009, 2011, 2013). That is, managers become better equipped to generate potential synergies with each successive deal. Although this is reflected in the wealth effect for acquirer stockholders, stockholder expectation is that persistent synergies also necessitate managers to bid more aggressively with each successive deal. The contribution of our study is to suggest that, all other things equal, this trade-off is most pronounced for larger serial acquirers. Furthermore, a similar line of reasoning can also potentially explain the serial effect. That is, again all other things equal, the serial effect is possible, at least in part, because we suspect all serial acquirers are associated with persistent synergies, and, hence, the trade-off in the wealth effect for acquirer stockholders, to a greater extent than time-varying synergies.

The rest of the paper is organized as follows. Section 2 describes our sample of acquisitions and firms. Sections 3 and 4 present and discuss our results for the size effect with and without sample-selection bias, respectively. Section 5 presents and discusses our additional results for the size effect for serial deals. Section 6 concludes.

2. Sample of acquisitions and firms

2.1. Sample construction

To construct the sample of acquisitions and firms, we first obtain data from the SDC Platinum database for all deals announced by UK listed firms during the period 1989-2014. The acquisitions that meet our selection criteria described later are then merged with the annual populations of listed firms reconstructed from live and dead constituents of the Datastream database. However, we exclude firms with an Industry Classification Benchmark

(ICB) super-sector related to either financials or utilities because acquisitions by firms in these industries attract more public scrutiny.

There are two interrelated reasons for why we choose to conduct the study on UK, rather than US, firms. First, Companies Acts in the UK render managerial entrenchment less effective than is the case in the US, because of the relative ease at which pre-emptive antitakeover provisions (for example, staggered boards and poison pills) can be rescinded by stockholders. This feature of UK company law is potentially important in the context of our study because entrenchment has been shown to be related to poorer acquisitions. In particular, Masulis, Wang, and Xie (2007) and Harford, Humphery-Jenner, and Powell (2012) find that acquisitions by US firms with more entrenchment provisions generate significantly less wealth for acquirer stockholders than those by firms with fewer entrenchment provisions. Second, and again in contrast to the situation in the US, Companies Acts in the UK make it mandatory for acquisitions with a deal value of at least 25 percent of the would-be acquirer's value to first gain approval from a majority of stockholders. In this regard, Becht, Polo, and Rossi (2016) find acquisitions by UK firms that cross the relative-size threshold generate significantly more wealth for acquirer stockholders than would have been the case had stockholder approval not been necessary.

The evidence would therefore seem to suggest company law in the UK has more potential than is the case in the US to reduce managerial opportunities for relatively large acquisitions that are perceived by stockholders to be from a pursuit of self-interest (for example, power, private benefits of control, and entrenchment). If so, for the UK, potential synergies and managerial hubris are more probable unobservable factors jointly affecting acquisition likelihood and, oppositely, the wealth effect for acquirer stockholders. Although a manager imbued with hubris is less likely to have selfish intentions, the outcome for stockholder wealth is likely to be similar to the case of a self-serving manager. However, for

the UK, a negative joint effect of unobservable factors is more likely to be indicative of managerial hubris than a pursuit of managerial self-interest.

Our criteria for selecting the acquisitions for inclusion in the sample start out essentially the same as those in the closely-related study of Moeller et al. (2004). That is, the acquisitions comprise deals for public, private, and subsidiary firms. All deals require the acquirer to purchase at least 50 percent of the share capital of the firm being acquired and to end up with outright ownership. We also drop acquisitions with a size of less than US$ 1 million in real (2014) terms and deals with a size of less than 1 percent of the market value of the acquirer.[9] However, we include both domestic and cross-border acquisitions, whereas Moeller et al. (2004) only select domestic deals. The reasons for this departure from their selection criteria are that the main objective of our study is to not only re-examine the size effect, but also to do so separately for serial and non-serial acquisition. By extending the sample to cross-border deals, which account for 31.1 percent of the total acquisitions, we guarantee to have as close to possible a full record of the deals for each firm. With the exception of Karolyi et al. (2015), who report a similar percentage of cross-border deals for acquirers from around the world, other studies classify acquirers as serial acquirers by only considering their domestic acquisitions.

Serial acquirers in our sample range from being "occasional" acquirers (only two acquisitions in a three-year period) to being "frequent" acquirers (at least five acquisitions in a three-year period), as per the definitions of Fuller et al. (2002) and Golubov et al. (2015). However, our definition of a serial deal is such that firms become serial acquirers based on

[9] Our proxy for absolute acquisition size, which also serves as the numerator for deal size relative to acquirer size, is the deal value times $\frac{1}{1 - \text{toehold}}$, where toehold is the percentage of the share capital of the firm being acquired that is already owned by the acquirer. This proxy provides a closer approximation to the real size of the firm that is to be integrated into the acquirer. However, instead assuming that toehold is zero (results not presented) does not alter our findings discussed later. For the denominator for deal size relative to acquirer size, the market value of the acquirer is the market value of equity minus book value of equity plus book value of total assets for the fiscal period end before the calendar year of the acquisition announcement.

only the relative closeness of their current and last acquisitions. This definition (which requires us to backtrack to 1986) avoids lookahead bias by not, as in most other studies, defining firms as serial acquirers based also on their subsequent acquisitions.[10] The definition also enables us to end up with a clean as possible set of non-serial deals, which represent the first acquisitions of firms for at least a three-year period.

2.2. Distribution of acquisitions and firms

Table 1 presents the frequency, aggregate size, and intensity of acquisitions during our sample period. The sample comprises a total of 10,384 acquisitions, with an aggregate size of US$ 986.6 trillion, by 7,171 acquirers from 42,251 firm calendar years.[11]

On deconstructing the sample there are a total of 6,895 (3,489) serial (non-serial) deals by 4,265 (3,489) serial (non-serial) acquirers. Furthermore, the aggregate size of serial (non-serial) deals amounts to a total of US$ 662.6 (324.0) trillion. Serial acquisition is therefore the largest subgroup of our sample based on frequency of deals and acquirers and aggregate acquisition size. However, in amounting to a third of all deals, close to half of all acquirers, and a third of the aggregate size of all deals, non-serial acquisition is far from being an insignificant subgroup of our sample. Based on frequency of deals and acquirers and aggregate deal size, serial acquisition peaks during 1997-2000 in what is generally regarded as the fifth merger wave. Even so, the aggregate size of serial deals remains relatively high through to the financial crisis in 2008. With the exception of the tailend of the fourth merger wave of the late 1980s, when a relatively high frequency of firms were doing their first deals for at least a three-year period, non-serial acquisition is more evenly distributed than serial acquisition.

[10] Billet and Qian (2008) also rely on backtracked acquisitions to identify serial acquirers. However, their study is different to ours in so far as serial acquirers are defined in terms of managers, rather than firms. This approach is unsuitable for a study, like ours, of the size effect because managers can do acquisitions at the helm of different firms.

[11] The numbers of observations in subsequent Tables are less than the totals that we report here because of insufficient data to construct certain variables. However, the relative proportions of acquirers to firm calendar years and of serial and non-serial deals/acquirers remain essentially the same.

The last column in Table 1 presents a proxy for the overall intensity of acquisitions during our sample period. Studies that attempt to gauge acquisition intensity, such as Rossi and Volpin (2004) and Netter, Stegemoller, and Wintoki (2011), typically resort to proxies based on either the number of deals as a proportion of the population of firms or the aggregate size of deals as a proportion of the aggregate size of the firm population. However, we utilize a combination of these proxies to produce a value-weighted (aggregate deal size divided by aggregate market value of firms) proxy for acquisition intensity. Evidencing similarities with aspects of the distribution of both serial and non-serial acquisition, overall deal intensity is at its highest at the tailend of the fourth merger wave and during the fifth merger wave. Furthermore, the overall intensity of acquisitions is at its lowest from the financial crisis through to the end of our sample period.

2.3. Descriptive statistics for acquirer and deal characteristics

Table 2 presents descriptive statistics for acquirer and deal characteristics that have been shown in other studies of acquisitions (many of which have already been mentioned) to explain the wealth effect for acquirer stockholders. We provide detailed definitions, and timings with respect to calendar (acquisition announcement) years, for the acquirer and deal characteristics in Table A1 in the Appendix.

In the context of re-examining the size effect, the two main variables of interest are cumulative abnormal return for acquirer stockholders centered on the acquisition announcement date (CAR) and acquirer size (SIZE). CAR averages 1.0 percent across all deals. Our mean estimate of the overall wealth effect for acquirer stockholders is almost identical to that of Moeller et al. (2004). However, on average, serial deals generate less wealth (CAR = 0.7 percent) for acquirer stockholders than non-serial deals (CAR = 1.8 percent). The difference between the mean wealth effects is significant at the one-percent level. This serial effect is also documented by Karolyi et al. (2015). Across all deals and in

real (2014) terms, SIZE averages US$ 7,765.1 million based on the market value of the acquirer. The difference between the means of SIZE for serial and non-serial deals is positive and significant at the one-percent level. Yet, with SIZE averaging US$ 5,946.0 million, non-serial deals are far from involving small acquirers. Nor do non-serial deals lack sufficient SIZE variation (standard deviation = US$ 27,115.3 million) for us to be able to potentially detect a size effect for this subgroup of acquisitions.

The descriptive statistics presented in Table 2 also reveal that serial and non-serial acquisition differs significantly along many other dimensions. Differences in the other acquirer and deal characteristics, which subsequently serve as control variables, reinforce our intent to re-examine the size effect separately for serial and non-serial acquisition.

3. Size effect with sample-selection bias

We first examine whether or not a size effect exists for our sample of acquisitions and, new to the literature, whether or not one exists separately for both serial and non-serial deals. However, at this initial stage in the analysis we do not account for the possibility that any size effect is a spurious result of sample-selection bias. That is, we neither account for any effect firm size also has on acquisition likelihood, nor account for any correlation between acquirer size and unobservable factors jointly affecting acquisition likelihood and the wealth effect for acquirer stockholders.

Table 3 presents coefficients for linear regressions of CAR on SIZE (based on the natural logarithm of the market value of the acquirer), and the other acquirer and deal characteristics. With the exception of the firm-age variables, we include the other acquirer characteristics in industry-adjusted form (at the level of the ICB super-sector). However, instead estimating the effects on CAR from these control variables in raw form (results not presented) does not alter our findings discussed later. We also control for ICB super-sectors

and calendar years. Although standard errors are presented in bootstrapped form, for reasons of consistency explained later, significance levels are essentially the same as those that, like Moeller et al. (2004), we also estimate with conventional standard errors, which are also clustered at the level of the acquirer. Our decision to estimate standard errors in bootstrapped form accounts for why a Wald, rather than a conventional (F-), statistic is presented at the bottom of each regression to gauge overall model significance.

The regression results reveal that both serial and non-serial deals by larger firms generate significantly less wealth for acquirer stockholders than corresponding acquisitions by smaller firms. However, the size effect is more pronounced for serial deals, even though the coefficient for SIZE is larger for non-serial deals. Specifically, the size effects for serial and non-serial deals are significant at the one- and five-percent levels, respectively. The effect of increasing SIZE by as little as US$ 10 million is expected to decrease CAR by as much as 1.0 and 1.2 percentage points for serial and non-serial deals, respectively. Compared to the averages of CAR for serial and non-serial deals that we reported earlier, both of the predicted size effects are economically large.

Only a small number of control variables gain significance to at least the five-percent level. Of the control variables that do, acquisitions for private and subsidiary firms generate significantly more wealth for acquirer stockholders than those for public firms. Among other studies, these results are consistent with the findings of Chang (1998) for acquisitions as a whole and Fuller et al. (2002) for serial deals only. Yet we find that the result also applies to non-serial deals. Furthermore, only the effects on CAR from the deal-size variables evidence variation between serial and non-serial acquisition. In their re-examination of the size effect for acquisitions as a whole, Schneider and Spalt (2017) demonstrate the importance of permitting deal size to vary independently of, rather than only relatively to, acquirer size. However, we find that both absolute and relative acquisition size affects CAR for serial deals,

but that neither proxy for acquisition size affects CAR for non-serial deals. These results suggest that for non-serial deals there is little difference between absolute and relative acquisition size when it comes to determining the wealth effect for acquirer stockholders. For serial acquisition, larger deals per se generate significantly more wealth for acquirer stockholders than smaller deals, whereas the wealth effect for larger deals in relative terms only is significantly less than for correspondingly smaller deals. These results suggest that while larger acquisitions in absolute terms have more potential to generate synergies, complexities of post-acquisition integration are expected to adversely affect synergies more the larger is the acquired firm relative to the acquirer.

The last column in Table 3 presents regression results for all deals. Given the results for serial and non-serial deals, it is unsurprising that a size effect is also plainly evident when we pool acquisitions. Our estimate of the overall size effect is reasonably close to that of Moeller et al. (2004). However, unlike them, we add to the regression a binary variable that is equal to one for a serial deal and zero for a non-serial deal. The coefficient and significance level for this variable reveal that, no matter SIZE and the many control variables, serial deals generate significantly less wealth for acquirer stockholders than non-serial deals. Specifically, the serial effect is significant at the one-percent level. The effect of changing from a non-serial deal to a serial deal is expected to decrease CAR by as much as 0.9 percentage points. Compared to the average CAR for all deals that we reported earlier, the predicted serial effect is economically large. Our multivariate estimate of the serial effect is in line with that of Karolyi et al. (2015).

4. Size effect without sample-selection bias

We now account for the possibility that the size effects for serial and non-serial acquisition found earlier are a spurious result of sample-selection bias. In the first stage of

controlling for any sample-selection bias we account for any effect firm size also has on acquisition likelihood, and for the possibility that any effect is quite different for serial and non-serial deals. Then in the corresponding second stage we account for any correlation between acquirer size and unobservable factors jointly affecting acquisition likelihood and the wealth effect for acquirer stockholders, facets of any sample-selection bias that may also vary between serial and non-serial deals.

4.1. Acquisition likelihood

Table A2 in the Appendix presents descriptive statistics for firm and firm-environment characteristics that have been shown in other studies (see, for example, Harford, 1999; Gorton, Kahl, and Rosen, 2009; Owen and Yawson, 2010; Cai, Song, and Walkling, 2011; Arikan and Stulz, 2016) to explain acquisition likelihood. We provide detailed definitions, and timings with respect to calendar years, for the firm and firm-environment characteristics in Table A1. The firm-environment characteristics are intended to capture structural aspects of the ICB super-sectors in which firms operate, as well as industry and general merger waves.

In the context of re-examining the size effect, the main variable of interest is firm size (SIZE). Across all firm calendar years and in real (2014) terms, SIZE averages US$ 3,849.0 million based on the market value of the firm. However, the difference between the means of SIZE for acquirers as a whole and non-acquirers is positive and significant at the one-percent level.

The descriptive statistics presented in Table A2 also reveal that acquirers as a whole and non-acquirers differ significantly along many other dimensions. Differences in the other firm and firm-environment characteristics provide justification for our subsequent inclusion of the other firm characteristics as control variables, and the firm-environment characteristics as a means to satisfy the need for exclusion restrictions, in the first stage of modelling sample

selection. In contrast to the situation for acquisition likelihood, we have no similarly strong reasons to suspect that the firm-environment characteristics also directly matter when it comes to determining the wealth effect for acquirer stockholders.

Table 4 presents average marginal effects for probit regressions for the effect of SIZE (based on the natural logarithm of the market value of the firm), and the other firm and firm-environment characteristics, on acquisition likelihood. The dependent variables are binary and equal to one for the type of acquirer and zero for any other firm. With the exception of the firm-age variables, we include the other firm characteristics in industry-adjusted form (at the level of the ICB super-sector). However, instead estimating the effects on acquisition likelihood from these control variables in raw form (results not presented) does not alter our findings discussed later. Because of the firm-environment variables we do not also control for ICB super-sectors and calendar years. Standard errors are presented in bootstrapped form, again for reasons explained later, and clustered at the level of the firm.

The regression results reveal that larger firms are significantly more likely to become both serial and non-serial acquirers than smaller firms. However, the effect of SIZE is more pronounced for serial acquisition likelihood. Specifically, the effect of SIZE on both serial and non-serial acquisition likelihood is significant at the one-percent level, but the difference between the effects also gains significance at the one-percent level. The effect of increasing SIZE by as little as US$ 10 million is expected to increase serial and non-serial acquisition likelihood by as much as 5.9 and 0.5 percentage points, respectively. Compared to the actual rates of serial and non-serial acquisition (10.1 and 8.3 percent, respectively, as computed from the totals presented at the bottom of Table 1 by expressing the numbers of serial and non-serial acquirers as a percentage of the number of firms), both of the predicted effects of SIZE on acquisition likelihood are economically large.

Most of the control variables and exclusion restrictions gain significance to at least the five-percent level. Of the control variables that do, acquirers as a whole are significantly more likely than all other firms to have higher sales growth and Return On Assets (but mainly because of serial acquirers), and to have higher ROA volatility (but more because of non-serial acquirers) and lower leverage ratios (but mainly because of serial acquirers). Although the firm-age and cash-liquidity variables are positively but insignificantly related to acquisition likelihood as a whole, we find that non-serial acquirers are significantly more likely than all other firms to be among the oldest firms and to have higher liquidity ratios. However, we also find that serial acquirers are significantly more likely than all other firms to have lower liquidity ratios.

Of the exclusion restrictions that gain significance, acquirers as a whole (but mainly because of serial acquirers) are significantly more likely than all other firms to operate in an ICB super-sector for which both median firm age and firm-age dispersion are higher and sales concentration is lower, and to be in both an industry and a general (deal) merger wave. Although the industry-duration restriction is positively but insignificantly related to acquisition likelihood as a whole, we find that non-serial acquirers are significantly more likely than all other firms to operate in an ICB super-sector with a longer elapsed time since the last acquisition (with a deal size of at least US$ 10 million) by any firm in the industry. This latter result suggests that non-serial acquirers favor more stable industry conditions.

The last column in Table 4 presents regression results for all acquirers. Given the results for serial and non-serial acquirers, it is unsurprising that a positive effect of SIZE on acquisition likelihood is also plainly evident when we pool acquirers. Our new findings imply that, no matter other firm and firm-environment characteristics, larger firms have more financial and operational capacity for acquisition, but in particular for serial acquisition, than smaller firms. If SIZE affects acquisition likelihood and not only the wealth effect for

acquirer stockholders, the size effects that we found earlier manifest from samples characterized by more censoring of smaller firms. This concern is especially pertinent for the subgroup of acquirers that do serial deals.

However, on its own this condition is insufficient to show a spurious size effect. The other necessary and interrelated conditions are for acquirer size, as a consequence of more censoring of smaller firms, to be substantially correlated with unobservable, and thus far omitted, factors that jointly and significantly affect acquisition likelihood and the wealth effect for acquirer stockholders. These unobservable factors are conceivably related to potential synergies and managerial hubris, acquisition drivers that are time-varying, at least in part, either because different managers can do deals at the helm of the same firm, or because these drivers do not persist even with the same manager at the helm. Although the many firm characteristics that we include as control variables may also proxy for these unobservable factors, the proxies are unlikely to capture all information about potential synergies and all traits of irrational managerial behavior.

In a sample-selection model (see Heckman, 1979), the joint effect of unobservable factors can be estimated by utilizing an Inverse Mills Ratio (IMR) that, in the context of our study, is computed from the first-stage regressions of acquisition likelihood and then added to the corresponding second-stage regressions of the wealth effect for acquirer stockholders. A positive (negative) coefficient for the IMR would more likely be indicative of potential synergies (managerial hubris) that increase(s) acquisition likelihood and increase (decreases) the wealth effect for acquirer stockholders. Given we find firm and firm-environment characteristics affect serial and non-serial acquisition likelihood to varying extents and in different ways, it is possible that both the coefficient and significance level for the IMR, and the extent of any correlation between acquirer size and the IMR, are also quite different for serial and non-serial deals.

4.2. Wealth effect for acquirer stockholders

Table 5 presents coefficients for linear regressions of CAR on SIZE equivalent to those presented earlier, except that now we add the IMR to generate pseudo sample-selection models. We follow Warusawitharana (2008), but in a different context of utilizing pseudo sample-selection models, in having to estimate standard errors in bootstrapped form because the IMR is computed from the first-stage regressions at the level of the firm and then added to the corresponding second-stage regressions at the level of the deal.

The sample-selection results reveal that the effect of the IMR on CAR is positive for both serial and non-serial deals. However, the IMR only gains significance to at least the five-percent level for non-serial deals. Furthermore, adding the IMR to the second-stage regression for non-serial deals gains 1.1 percentage points of model explanatory power, as compared to an adjusted R-squared of 5.9 percent (presented at the bottom of Table 3) for the corresponding ordinary linear regression. These results suggest that, no matter the type of deal, unobservable factors related to potential synergies are more likely to be perceived by the market as the dominant driver of acquisition, as reflected in the wealth effect for acquirer stockholders. That is, even for serial deals, a typical acquisition is not seen to be more prone to the adverse consequences (in particular, overpayment) of unobservable factors related to managerial hubris; otherwise we would expect to observe a negative relationship between CAR and the IMR.

Furthermore, we now find that only serial deals by larger firms generate significantly less wealth for acquirer stockholders than corresponding acquisitions by smaller firms. Specifically, for serial deals, the coefficient and significance level for SIZE are equivalent to those that we found earlier. For non-serial deals, a no longer significant size effect implies that SIZE and the IMR are negatively correlated. The correlation is substantial enough that in omitting the joint effect of unobservable factors more likely related to potential synergies, as

we have done thus far, for non-serial deals, the negative relationship between CAR and SIZE is shown to be overstated to an extent of being spurious. These results also reveal a nuance in situations that potentially involve sample-selection bias. That is, in the context of our study, although more censoring of smaller firms is a necessary first condition to show a spurious size effect, the other two interrelated conditions (the need for the IMR to be significant, and for there to be substantial correlation between SIZE and the IMR) are only more likely to manifest when there is more moderate censoring of smaller firms, as was earlier found to be the case for the subgroup of acquirers doing non-serial deals.

The last column in Table 5 presents sample-selection results for all deals. Given the results for serial and non-serial deals and the higher frequency for serial deals we reported earlier, it is somewhat surprising that a size effect is also no longer evident when we pool acquisitions. However, the effect of the IMR on CAR for acquisitions as a whole, while also positive, is smaller and less significant than that for non-serial deals. Our new findings imply that, no matter other acquirer and deal characteristics, smaller acquirers, but in particular smaller non-serial acquirers, require more potential synergies than larger acquirers. With greater uncertainty associated with being a smaller acquirer, it is rational for smaller acquirers, but in particular for smaller non-serial acquirers, to require greater potential synergies.

Surprisingly, in contrast to SIZE, the effects on CAR from the control variables that we also include in both stages of estimating the pseudo sample-selection models are generally consistent with those (mainly non-effects) found earlier. That is, even for non-serial acquisition and acquisition as a whole, the effects on CAR from these control variables are largely immune to sample-selection bias. The one main exception is the effect on CAR from firm age, which now gains significance for non-serial deals and in a way that moderately older firms generate more wealth for acquirer stockholders than younger firms. Furthermore, but unsurprisingly, the effects on CAR from the deal characteristics that we can only include

in the second stage of estimating the pseudo sample-selection models also remain essentially the same as those found earlier, including the serial (deal) effect for all deals in the last column in Table 5.

4.3. Robustness tests

We subject the sample-selection results to a battery of robustness tests. Panels A-D in Table A3 in the Appendix present coefficients for sample-selection models of CAR on SIZE. For reasons of brevity, we only present re-estimates for the main relationship of interest. However, re-estimates of the effects on CAR from the other acquirer and deal characteristics do not alter our prior findings for these control variables.

In regard to Panel A in Table A3, SIZE is thus far based on the market value of the acquirer, consistent with the main proxy of Moeller et al. (2004) for acquirer size. However, it is possible, but more so for serial acquirers, that the wealth effect for acquirer stockholders is partially anticipated in the market capitalization of the acquirer. To address this concern, in Panel A, we instead base SIZE (and SIZE_MEDIAN in the first-stage regressions of acquisition likelihood, re-estimates of which are not presented) on the book value of the acquirer (but with all else unchanged). In regard to Panel B in Table A3, CAR is thus far estimated with a market model, consistent with the main proxy of Moeller et al. (2004) for the wealth effect for acquirer stockholders. The main concern is that there may be confounding events in the estimation periods before acquisition announcement dates; in particular, past acquisitions in the case of serial acquirers. Therefore, in Panel B, we instead estimate CAR with a market-adjusted model (but with all else unchanged) and thus without the need for an estimation period.

In regard to Panel C in Table A3, the IMR is thus far computed from the first-stage regressions of acquisition likelihood in which the dependent variables are binary and equal to one for the type of acquirer and zero for any other firm. This regression design guarantees we

always include all firms active in a given calendar year; that is, not only in the regression of acquisition likelihood as a whole, but also in the regressions of serial and non-serial acquisition likelihood. However, the IMR, and, hence, the correlation between SIZE and the IMR, may be quite different were we always to permit only non-acquirers to be control firms in a given calendar year. To address this concern, in Panel C, we instead utilize this regression design for serial and non-serial acquisition (but with all else unchanged). Lastly, in regard to Panel D in Table A3, we have thus far estimated pseudo sample-selection models because the IMR is computed from the first-stage regressions at the level of the firm and then added to the corresponding second-stage regressions at the level of the deal. This model design guarantees that we always include all deals by the same acquirer in a given calendar year. Yet, other than for reasons of consistency with serial acquisition and acquisition as a whole, this econometric treatment is not required for non-serial acquisition because the levels of the firm and deal are indistinguishable. Therefore, in Panel D, we estimate a conventional sample-selection model for non-serial acquisition, which means that standard errors no longer need to be bootstrapped (2,000 times).

None of the robustness tests alter our prior findings for the size effect. The same is true for the serial (deal) effect for all deals in the last columns in Panels A and B in Table A3. Furthermore, the robustness tests in all but Panel B also require us to re-estimate the first-stage regressions of acquisition likelihood (re-estimates not presented). However, none of the robustness tests alter our prior findings for the effects of firm and firm-environment characteristics on acquisition likelihood.

5. Additional results for the size effect for serial acquisition

Thus far our findings suggest a possible connection between a size effect for non-serial, but not for serial, acquisition and the omission of unobservable, time-varying, factors

related to potential synergies. We next consider why it is that the size effect for serial acquisition is apparently immune to this sample-selection bias.

5.1. Block and non-block acquisition

We now suspect that the interrelated conditions necessary to show a spurious size effect are only more likely to manifest when there is more moderate censoring of smaller firms, as was earlier found not to be the case for the subgroup of acquirers doing serial deals. However, serial acquirers may be more heterogeneous than we have thus far assumed. Indeed, the findings of Macias et al. (2016) strongly suggest that serial acquirers cannot be profiled as a whole. In particular, not all serial acquirers do current and past acquisitions in especially close, or block, succession. Therefore, although we suspected earlier that larger firms have more financial and operational capacity for serial acquisition than smaller firms, more moderate censoring of smaller firms may occur in a subgroup of serial acquirers doing current and past acquisitions in non-block succession. We therefore examine whether or not a size effect exists separately for both block and non-block serial deals.

Table 6 presents average marginal effects for probit regressions for the effect of SIZE on serial acquisition likelihood. The dependent variables are binary and equal to one for the type of serial acquirer and zero for any other firm; otherwise the regressions are equivalent to the one that we presented earlier for serial acquisition likelihood as a whole. Our definition of a block deal is such that firms become block serial acquirers based on an elapsed time of no more than one year between their current and last acquisitions. Non-block deals therefore represent the first acquisitions of non-block serial acquirers for at least one year. On deconstructing the total numbers of serial acquisitions and acquirers that we reported earlier, there are a total of 4,877 (2,018) block (non-block) deals by 2,408 (1,857) block (non-block)

acquirers.[12] Block acquisition is therefore the largest subgroup of serial deals/acquirers in our sample based on frequency of acquisitions and acquirers. However, in amounting to close to a quarter of all acquisitions and not that far off half of all acquirers, non-block acquisition is far from being an insignificant subgroup of serial deals/acquirers in our sample.

The regression results reveal that larger firms are significantly more likely to become both block and non-block serial acquirers than smaller firms. Furthermore, the difference between the effects of SIZE on block and non-block serial acquisition likelihood fails to gain significance to at least the five-percent level. As is the case for SIZE, most of the control variables and exclusion restrictions gain significance to at least the five-percent level with effects on both block and non-block acquisition likelihood that are generally consistent with those we found earlier for serial acquisition likelihood as a whole. However, we find that block and non-block serial acquisition likelihood differs significantly along only two dimensions. Specifically, compared to all other firms, block acquirers are significantly more likely than non-block serial acquirers to have higher market-to-book (Q-) ratios (which we found earlier not to have any effect on serial acquisition likelihood as a whole), and to operate in an ICB super-sector for which sales concentration is lower.

Table 7 presents coefficients for both ordinary linear regressions and pseudo sample-selection models of CAR on SIZE equivalent to those presented earlier for serial acquisition as a whole, except that now we add the IMR computed from the first-stage regressions of block and non-block acquisition likelihood. As we found earlier for serial acquisition as a whole, the sample-selection results reveal that the effect of the IMR on CAR fails to gain significance to at least the five-percent level for both block and non-block deals. Furthermore, we find that both types of serial deal by larger firms generate significantly less wealth for

[12] The numbers of observations in subsequent Tables are less than the totals that we report here because of insufficient data to construct certain variables. However, the relative proportions of block and non-block serial deals/acquirers remain essentially the same.

acquirer stockholders than corresponding acquisitions by smaller firms. Specifically, both of the size effects are significant at the one-percent level, as we also found earlier for serial acquisition as a whole. For block and non-block deals, the effects on CAR from the control variables are also generally consistent with those that we found earlier for serial acquisition as a whole. Unsurprisingly, given that the IMR fails to gain significance for both types of serial deal, the coefficients and significance levels for SIZE, and for each of the control variables, are essentially the same as those in the corresponding ordinary linear regressions. These results suggest that, no matter whether we examine serial acquirers as a whole or in subgroups, the size effect for serial acquisition is immune to sample-selection bias.

Furthermore, we added to the ordinary linear regression and pseudo sample-selection model for all deals presented in the last columns in Tables 3 and 5, respectively, variables that are binary and equal to one for a block deal and zero for a non-block serial deal. The coefficients and significance levels for these variables reveal that, no matter SIZE and the many control variables, block deals generate insignificantly (to at least the five-percent level) less wealth for acquirer stockholders than non-block serial deals.

5.2. Firm fixed effects

We have thus far utilized the IMR to model unobservable factors as not only potentially affecting the wealth effect for acquirer stockholders, but also acquisition likelihood. That is, we have assumed unobservable factors, conceivably related to potential synergies and managerial hubris, are only time-varying. However, unobservable factors may also be time-invariant in only affecting the wealth effect for acquirer stockholders. Indeed, the findings of Golubov et al. (2015) strongly suggest that adding firm fixed effects for serial acquirers to ordinary linear regressions of the wealth effect for acquirer stockholders gains substantial model explanatory power, as compared to adjusted R-squares in other studies (see,

for example, Fuller et al., 2002; Klasa and Stegemoller, 2007) of serial acquisition in which these time-invariant controls are omitted.

Time-invariant, unobservable, factors are also conceivably related to potential synergies and managerial hubris, acquisition drivers that are persistent, at least in part, because managers can do serial deals either by remaining at the helm of the same firm, or by moving to firms in which these drivers already persist as a result of past acquisitions. Although the many serial-acquirer characteristics that we include as control variables may also proxy for these time-invariant factors, the proxies are unlikely to be sufficiently persistent to capture all information about potential synergies and all traits of irrational managerial behavior. Our main concern is that serial-acquirer size is correlated with time-invariant, unobservable, factors explaining a significant percentage of the variation in the wealth effect for acquirer stockholders, and to an extent the correlation shows a spurious size effect. We therefore account for time-invariant, unobservable, factors in re-estimating the size effect for serial acquisition.

Table 8 presents coefficients for both an ordinary linear regression and a pseudo sample-selection model of CAR on SIZE equivalent to those presented earlier, except that now we add firm fixed effects for serial acquirers. Because of these time-invariant controls we can only present standard errors in conventional, and non-clustered, form. The total numbers of serial deals by the same acquirer range from 2 to 66 in our sample.

As we found earlier, the sample-selection results reveal that the effect of the IMR on CAR fails to gain significance to at least the five-percent level. Furthermore, we still find that serial deals by larger firms generate significantly less wealth for acquirer stockholders than those by smaller firms. However, although the coefficient for SIZE is also still significant at the one-percent level, the predicted size effect is economically larger than that found earlier. Specifically, the effect of increasing SIZE by as little as US$ 10 million is now expected to

decrease CAR by as much as 1.9 percentage points. A now larger size effect implies that SIZE and the time-invariant controls are positively correlated. The correlation is substantial enough that in omitting the time-invariant controls, as we have done thus far, the negative relationship between CAR and SIZE is shown to be understated rather than spurious.

Furthermore, adding the firm fixed effects for serial acquirers to the pseudo sample-selection model gains 13.7 percentage points of explanatory power, as compared to an adjusted R-squared of 3.3 percent (presented at the bottom of Table 5) for the corresponding model in which we omit these time-invariant controls. Our estimate of the percentage of CAR variation explained by the time-invariant controls is more than 2.25 times that of Golubov et al. (2015) for serial acquisition as a whole. However, unlike us and Moeller et al. (2004), Golubov et al. (2015) include several interaction terms between methods of payment and whether the firms being acquired are public, private, or subsidiary firms.

Surprisingly, in contrast to SIZE, the effects on CAR from the control variables are generally consistent with those that we found earlier. That is, the effects on CAR from these control variables are largely uncorrelated with the time-invariant controls. The one main exception is the effect on CAR from relative (but not absolute) acquisition size, which now fails to gain significance to at least the five-percent level. Unsurprisingly, given that the IMR fails to gain significance, the coefficient and significance level for SIZE, and for each of the control variables, are essentially the same as those in the ordinary linear regression.

5.3. Distribution of wealth effects for acquirer stockholders

We now suspect time-invariant factors (modelled utilizing firm fixed effects) account for more of what drives acquisition for serial acquirers, but in particular for larger serial acquirers, than unobservable factors that are time-varying (modelled utilizing the IMR). Even so, we have no sense of whether or not potential synergies are more likely than managerial hubris to be the dominant, time-invariant, unobservable, driver of serial acquisition. However,

we have thus far estimated an average size effect, when to understand drivers of serial acquisition there is a need to relax the assumption that the size effect is constant in the distribution of wealth effects for acquirer stockholders. A coefficient for acquirer size that gets more (less) negative in moving from the lowest to the highest quantiles of wealth effects for acquirer stockholders would more likely be indicative of potential synergies (managerial hubris) as the dominant, persistent, unobservable, driver of serial acquisition. We therefore account for the distribution of wealth effects for acquirer stockholders in re-estimating the size effect for serial acquisition.

Table 9 presents coefficients for a pseudo sample-selection model of CAR on SIZE equivalent to the one presented earlier for the average size effect for serial acquisition, except that now we simultaneously estimate the main relationship of interest for quartiles of wealth effects for acquirer stockholders. Therefore, we can only present bootstrapped standard errors in non-clustered form and cannot utilize a statistic to gauge overall model significance. CAR equals -1.5, 0.3, and 2.5 percent at midpoints in the lower, middle, and upper quartiles of wealth effects for acquirer stockholders, respectively.

As we found earlier for the average size effect for serial acquisition, the sample-selection results reveal that the effect of the IMR on CAR fails to gain significance to at least the five-percent level in all quartiles of wealth effects for acquirer stockholders. Furthermore, in all quartiles, we still find that serial deals by larger firms generate less wealth for acquirer stockholders than those by smaller firms. However, the coefficient for SIZE gets more negative and significant in moving from the lower to the upper quartiles of wealth effects for acquirer stockholders. Only in the upper quartile of wealth effects for acquirer stockholders are the coefficient and significance level for SIZE equivalent to those that we found earlier for the average size effect for serial acquisition. These results suggest that time-invariant factors related to potential synergies, more so than those related to managerial hubris, account

for more of what in an unobservable sense drives a typical serial acquisition than time-varying factors. Since this inference comes from the size effect, we also suspect that larger serial acquirers are associated with persistent synergies to greater extent than smaller serial acquirers.

The effects on CAR from the control variables are generally consistent with those that we found earlier for the average size effect for serial acquisition. However, we find some exceptions. In particular, in all quartiles of wealth effects for acquirer stockholders, the effect on CAR from relative acquisition size now fails to gain significance to at least the five-percent level. Similar, but still oppositely, to SIZE, while larger serial deals per se generate more wealth for acquirer stockholders than smaller serial deals, the coefficient for absolute acquisition size gets more positive and significant in moving from the lower to the upper quartiles of wealth effects for acquirer stockholders. Furthermore, we find that some of the other control variables now gain significance to at least the five-percent level. Specifically, the effect on CAR from a higher Q-ratio is significantly negative (positive) in the lower (upper) quartile of wealth effects for acquirer stockholders. A higher leverage ratio and an unsolicited deal also have significant negative effects on CAR, but only in the upper quartile of wealth effects for acquirer stockholders.

Our findings suggest a possible connection between a size effect for serial deals and hidden, time-invariant, factors related to potential synergies to account for why the size effect for serial, unlike for non-serial, acquisition is immune to sample-selection bias (the omission of unobservable, time-varying, factors that are also more likely related to potential synergies). Furthermore, our findings for serial acquisition suggest reattributions for both the size and serial effects away from managerial hubris, for the size effect (see Moeller et al., 2004), and managerial self-interest, for the serial effect (see Karolyi et al., 2015), and more consistent with rational managerial behavior of a kind construed by Hirshleifer and Titman (1990) and

Aktas, de Bodt, and Roll (2009, 2011, 2013). That is, managers become better equipped to generate synergies with successive acquisitions. Although these persistent synergies are reflected in the wealth effect for acquirer stockholders, the market also perceives that for managers to persist in generating synergies it is rational for them to have to bid ever more aggressively.

Our new findings imply that, no matter other acquirer and deal characteristics and unobservable, time-varying, factors also more likely related to potential synergies, this trade-off in the wealth effect for acquirer stockholders is more pronounced for larger, than smaller, serial acquirers. Besides the size effect, this rational managerial behavior also potentially explains the serial effect because our new findings also imply that, no matter other acquirer and deal characteristics, serial acquirers as a whole are associated with persistent synergies, and, hence, with the same trade-off in the wealth effect for acquirer stockholders, to a greater extent than time-varying, unobservable synergies.

6. Conclusion

In this paper, we question why acquisitions by larger firms generate significantly less wealth for acquirer stockholders than acquisitions by smaller firms. This seemingly important size effect in the literature on corporate acquisitions is typically attributed to stockholder expectation that acquisitions by larger firms are more prone to the adverse consequences (overpayment in particular) of managerial hubris/self-interest. In contrast to both earlier and parallel studies, we not only examine the size effect by disregarding whether or not the same firm does acquisitions in relatively close succession (serial or non-serial acquisition), but also explore the relationships between the size effect and these different types of acquisition. Crucially, we account for the correlation between acquirer size and unobservable factors, like potential synergies and managerial hubris/self-interest, jointly affecting acquisition likelihood

and the wealth effect for acquirer stockholders. However, we also permit unobservable factors and the correlation to be different for serial and non-serial deals.

We find sample-selection bias results in a spurious size effect for both pooled and non-serial deals, but that accounting for unobservable factors and the correlation does not affect the size effect for serial deals. Our sample-selection results suggest larger firms have more financial and operational capacity for acquisition, but serial acquisition in particular, than smaller firms. However, smaller acquirers, but smaller non-serial acquirers in particular, require more potential synergies than larger acquirers. By design, these are time-varying synergies. Yet, unobservable factors, like potential synergies and managerial hubris/self-interest, also manifest in persistent form. After adding fixed effects for serial acquirers and also simultaneously examining the size effect for serial deals across quartiles of the wealth effect for acquirer stockholders, we infer larger serial acquirers are associated with persistent synergies to a greater extent than smaller serial acquirers. Moreover, it seems to make no difference whether or not serial acquirers have a tendency to do acquisitions in especially close succession.

Our findings for the size effect for both types of deal are consistent with rational managerial behavior. That is, with greater uncertainty associated with being a smaller acquirer, it is rational for smaller acquirers, but smaller non-serial acquirers in particular, to require greater time-varying synergies. In contrast, serial acquirers, but larger serial acquirers in particular, become better equipped to generate potential synergies with each successive deal. Although this is reflected in the wealth effect for acquirer stockholders, stockholder expectation is that persistent synergies also make it rational for serial acquirers, but larger serial acquirers in particular, to bid more aggressively with each successive deal. Notwithstanding that, all other things equal, this trade-off is most pronounced for larger serial acquirers, because we suspect all serial acquirers are affected by it, albeit to different extents,

a similar line of reasoning can also potentially explain why, again all other things equal, serial deals seem to generate significantly less wealth for acquirer stockholders than non-serial deals.

The efficiency of the market for corporate acquisitions can be impeded by many factors. Being a relatively large acquirer and a serial acquirer are separate factors long identified as potentially important. However, our large-sample analysis of the interrelationships between these two factors on the wealth effect for acquirer stockholders suggests this particular focus is misguided.

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Appendix

Table A1: Definitions for acquirer/firm, deal, and environment characteristics

This table presents definitions for acquirer/firm, deal, and environment characteristics for the sample of acquisitions and firms described in Table 1.

Acquirer/firm, deal, and environment characteristics	Definition
CAR	Acquirer cumulative abnormal return. Continuously compounded market-model-adjusted returns for the three trading days centred on the acquisition announcement date and estimated from the Datastream database with a FTSE All Share benchmark. Market-model parameters are estimated for the period from 302 to 43 trading days before the acquisition announcement date.
SIZE (market value)	Acquirer/firm size. Market value of equity minus book value of equity plus book value of total assets from the Datastream database for the fiscal period end before the acquisition announcement year. In million dollar units and real (2014) terms.
SIZE (book value)	Acquirer/firm size. Book value of total assets from the Datastream database for the fiscal period end before the acquisition announcement year. In million dollar units and real (2014) terms.
AGE	Acquirer/firm age. Acquisition announcement year minus base year in the Datastream database (minimum 1964) plus one.
AGE_MAXIMUM	Acquirer/firm maximum age. Binary variable equal to one for AGE equal to the acquisition announcement year minus 1964 plus one.
Q_RATIO	Acquirer/firm market to book ratio. Market value of equity minus book value of equity plus book value of total assets all divided by book value of total assets from the Datastream database for the fiscal period end before the acquisition announcement year.
Q_RATIO (industry-adjusted)	Acquirer/firm industry-adjusted market to book ratio. Q_RATIO minus median Q_RATIO for the Industry Classification Benchmark super-sector.
SALES_GROWTH	Acquirer/firm growth rate of sales. Average growth rate of sales (annualized and in real (2014) terms) from the Datastream database for a maximum of three and minimum of two fiscal period ends before the acquisition announcement year. In decimal units.
SALES_GROWTH (industry-adjusted)	Acquirer/firm industry-adjusted growth rate of sales. SALES_GROWTH minus median SALES_GROWTH for the Industry Classification Benchmark super-sector.
ROA	Acquirer/firm return on assets. Operating income plus depreciation all divided by book value of total assets from the Datastream database for the fiscal period end before the acquisition announcement year.
ROA (industry-adjusted)	Acquirer/firm industry-adjusted return on assets. ROA minus median ROA for the Industry Classification Benchmark super-sector.
ROA_VOLATILITY	Acquirer/firm volatility of return on assets. Standard deviation of ROA for a maximum of three and minimum of two fiscal period ends before the acquisition announcement year.
ROA_VOLATILITY (industry-adjusted)	Acquirer/firm industry-adjusted volatility of return on assets. ROA_VOLATILITY minus median ROA_VOLATILITY for the Industry Classification Benchmark super-sector.
LEVERAGE_RATIO	Acquirer/firm leverage ratio. Book value of total debt divided by book value of total assets from the Datastream database for the fiscal period end before the acquisition announcement year.
LEVERAGE_RATIO (industry-adjusted)	Acquirer/firm industry-adjusted leverage ratio. LEVERAGE_RATIO minus median LEVERAGE_RATIO for the Industry Classification Benchmark super-sector.

Table A1 (cont.): Definitions for acquirer/firm, deal, and environment characteristics

Acquirer/firm, deal, and environment characteristics	Definition
LIQUIDITY_RATIO	Acquirer/firm liquidity ratio. Cash and marketable securities divided by book value of total assets from the Datastream database for the fiscal period end before the acquisition announcement year.
LIQUIDITY_RATIO (industry-adjusted)	Acquirer/firm industry-adjusted liquidity ratio. LIQUIDITY_RATIO minus median LIQUIDITY_RATIO for the Industry Classification Benchmark super-sector.
SERIAL_DEAL	Serial deal. Binary variable for a deal following in the preceding three years at least one other acquisition in the SDC Platinum database (meeting criteria as for the sample acquisitions) with the same acquirer Datastream database code.
BLOCK_DEAL	Block deal. Binary variable equal to one for a deal following in the preceding year at least one other acquisition in the SDC Platinum database (meeting criteria as for the sample acquisitions) with the same acquirer Datastream database code.
DEAL_SIZE	Deal size. Deal value times $\frac{1}{1 - \text{toehold}}$ (where toehold is the percentage of the share capital of the firm being acquired that is already owned by the acquirer) from the SDC Platinum database. In million dollar units and real (2014) terms.
RELATIVE_SIZE	Deal size to acquirer size. Deal value times $\frac{1}{1 - \text{toehold}}$ (where toehold is the percentage of the share capital of the firm being acquired that is already owned by the acquirer) from the SDC Platinum database divided by market value of equity minus book value of equity plus book value of total assets from the Datastream database for the fiscal period end before the acquisition announcement year.
PUBLIC_DEAL	Public deal. Binary variable from the SDC Platinum database equal to one for an acquisition of a public firm.
PRIVATE_DEAL	Private deal. Binary variable from the SDC Platinum database equal to one for an acquisition of a private firm.
SUBSIDIARY_DEAL	Subsidiary deal. Binary variable from the SDC Platinum database for an acquisition of a subsidiary firm.
STOCK_DEAL	Stock-payment deal. Binary variable from the SDC Platinum database equal to one for an acquisition paid for all in stock.
CASH_DEAL	Cash-payment deal. Binary variable from the SDC Platinum database equal to one for an acquisition paid for all in cash.
MIXED_DEAL	Mixed-payment deal. Binary variable from the SDC Platinum database equal to one for an acquisition paid for in any combination of stock, cash, and other forms.
DIVERSIFYING_DEAL	Diversifying deal. Binary variable from the SDC Platinum database equal to one for a cross-industry acquisition.
CROSSBORDER_DEAL	Cross-border deal. Binary variable from the SDC Platinum database equal to one for a cross-country acquisition.
UNSOLICITED_DEAL	Unsolicited deal. Binary variable from the SDC Platinum database equal to one for an unsolicited acquisition.
RIVAL_DEAL	Rival deal. Binary variable from the SDC Platinum database equal to one for an existing rival acquisition attempt.
SIZE_MEDIAN (market value)	Industry median firm size. Median SIZE (market value) for the Industry Classification Benchmark super-sector.
SIZE_MEDIAN (book value)	Industry median firm size. Median SIZE (book value) for the Industry Classification Benchmark super-sector.

Table A1 (cont.): Definitions for acquirer/firm, deal, and environment characteristics

Acquirer/firm, deal, and environment characteristics	Definition
AGE_MEDIAN	Industry median firm age. Median AGE for the Industry Classification Benchmark super-sector.
AGE_DISPERSION	Industry dispersion of firm age. Thiel index for AGE for the Industry Classification Benchmark super-sector.
CONCENTRATION	Firm-industry concentration. Herfindahl index for the shares of sales (annualized and in decimal units) for the Industry Classification Benchmark super-sector from the Datastream database for the fiscal period ends before the acquisition announcement year.
INDUSTRY_DURATION	Firm industry deal duration. Number of days (maximum 730) before the acquisition announcement year to an acquisition in the SDC Platinum database (meeting criteria as for the sample acquisitions except that deals with DEAL_SIZE less than ten million dollars are excluded) for the Industry Classification Benchmark super-sector.
INDUSTRY_INTENSITY	Firm industry deal intensity. Total number of deals divided by number of firms and multiplied by aggregate DEAL_SIZE divided by aggregate SIZE (market value) for the Industry Classification Benchmark super-sector and acquisition announcement year.
INDUSTRY_WAVE	Firm industry deal wave. Binary variable equal to one for INDUSTRY_INTENSITY at least one standard deviation above the average INDUSTRY_INTENSITY for the Industry Classification Benchmark super-sectors.
DEAL_INTENSITY	Deal intensity. Total number of deals divided by number of firms and multiplied by aggregate DEAL_SIZE divided by aggregate SIZE (market value) for the acquisition announcement year.
DEAL_WAVE	Deal wave. Binary variable equal to one for DEAL_INTENSITY at least one standard deviation above the average DEAL_INTENSITY.

Table A2: Descriptive statistics for firm and environment characteristics

This table presents descriptive statistics for firm and environment characteristics for the sample of acquisitions and firms described in Table 1. Descriptive statistics are at the level of the firm and acquisition announcement year. Firm and environment characteristics are defined in Table A1 of the Appendix. $^{\$\$, \$}$ indicate statistical significance of mean (median) differences in firm and environment characteristics between acquirers and non-acquirers at the one- and five-percent levels respectively.

	All firms			Acquirers			Non-acquirers		
Firm and environment characteristics	**Mean (Median)**	**Standard deviation**	**No. of observations**	**Mean (Median)**	**Standard deviation**	**No. of observations**	**Mean (Median)**	**Standard deviation**	**No. of observations**
SIZE (market value)	3,849.0	16,425.9	34,735	5,271.4$^{\$\$}$	19,072.6	6,408	3,527.2	15,748.2	28,327
	(168.5)			(421.0)$^{\$\$}$			(137.7)		
SIZE (book value)	2,539.4	10,915.3	36,573	3,390.2$^{\$\$}$	12,407.5	6,610	2,351.7	10,548.8	29,963
	(108.2)			(240.4)$^{\$\$}$			(91.5)		
AGE	14.0	12.5	42,251	16.4$^{\$\$}$	13.0	7,171	13.5	12.3	35,080
	(9.0)			(12.0)$^{\$\$}$			(9.0)		
AGE_MAXIMUM	0.106	0.308	42,251	0.167$^{\$\$}$	0.373	7,171	0.094	0.292	35,080
Q_RATIO	2.040	2.264	34,731	2.019	1.919	6,408	2.045	2.334	28,323
	(1.371)			(1.501)$^{\$\$}$			(1.339)		
Q_RATIO	0.571	2.175	34,731	0.516$^{\$}$	1.805	6,408	0.583	2.250	28,323
(industry-adjusted)	(0.000)			(0.071)$^{\$\$}$			(-0.010)		
SALES_GROWTH	0.411	1.403	29,866	0.446	1.473	6,115	0.458	1.663	26,999
	(0.118)			(0.149)$^{\$\$}$			(0.116)		
SALES_GROWTH	0.320	1.617	33,114	0.303	1.461	6,115	0.323	1.650	26,999
(industry-adjusted)	(0.000)			(0.020)$^{\$\$}$			(-0.003)		
ROA	-0.038	0.393	36,049	0.050$^{\$\$}$	0.262	6,550	-0.058	0.414	29,499
	(0.061)			(0.090)$^{\$\$}$			(0.053)		
ROA (industry-adjusted)	-0.082	0.378	36,049	-0.011$^{\$\$}$	0.255	6,550	-0.098	0.398	29,499
	(0.000)			(0.015)$^{\$\$}$			(-0.004)		
ROA_VOLATILITY	0.151	0.394	32,089	0.102$^{\$\$}$	0.304	5,724	0.162	0.410	26,365
	(0.039)			(0.028)$^{\$\$}$			(0.043)		
ROA_VOLATILITY	0.100	0.387	32,089	0.057$^{\$\$}$	0.298	5,724	0.110	0.403	26,365
(industry-adjusted)	(0.000)			(-0.004)$^{\$\$}$			(0.001)		

Table A2 (cont.): Descriptive statistics for firm and environment characteristics

	All firms			Acquirers			Non-acquirers		
Firm and environment characteristics	**Mean (Median)**	**Standard deviation**	**No. of observations**	**Mean (Median)**	**Standard deviation**	**No. of observations**	**Mean (Median)**	**Standard deviation**	**No. of observations**
LEVERAGE_RATIO	0.192 (0.143)	0.211	36,526	0.190 (0.158)$^{\$\$}$	0.179	6,607	0.192 (0.139)	0.218	29,919
LEVERAGE_RATIO (industry-adjusted)	0.049 (0.000)	0.205	36,526	0.033$^{\$\$}$ (0.002)$^{\$}$	0.168	6,607	0.052 (0.000)	0.212	29,919
LIQUIDITY_RATIO	0.169 (0.089)	0.209	35,853	0.147$^{\$\$}$ (0.084)$^{\$\$}$	0.178	6,457	0.174 (0.091)	0.215	29,396
LIQUIDITY_RATIO (industry-adjusted)	0.063 (0.000)	0.196	35,853	0.049$^{\$\$}$ (0.000)	0.170	6,457	0.066 (0.000)	0.201	29,396
SIZE_MEDIAN (market value)	416.5 (172.1)	1,441.1	42,244	497.1$^{\$\$}$ (195.8)$^{\$\$}$	1,632.2	7,171	400.1 (160.2)	1,398.3	35,073
SIZE_MEDIAN (book value)	300.6 (107.2)	1,115.0	42,247	367.2$^{\$\$}$ (119.2)$^{\$\$}$	1,283.8	7,171	287.0 (105.7)	1,076.8	35,076
AGE_MEDIAN	9.6 (10.0)	2.5	42,251	9.9$^{\$\$}$ (10.0)	2.8	7,171	9.6 (10.0)	2.4	35,080
AGE_DISPERSION	0.340 (0.336)	0.094	42,251	0.339 (0.336)	0.095	7,171	0.340 (0.334)	0.094	35,080
CONCENTRATION	0.142 (0.089)	0.133	42,251	0.121$^{\$\$}$ (0.080)$^{\$\$}$	0.118	7,171	0.147 (0.093)	0.136	35,080
INDUSTRY_DURATION	527.2 (730.0)	303.4	42,251	550.4$^{\$\$}$ (730.0)	295.0	7,171	522.4 (730.0)	304.9	35,080
INDUSTRY_INTENSITY	2.612 (0.317)	12.646	42,251	3.641 $^{\$\$}$ (0.620)$^{\$\$}$	15.440	7,171	2.402 (0.291)	11.984	35,080
INDUSTRY_WAVE	0.180	0.384	42,251	0.247$^{\$\$}$	0.431	7,171	0.166	0.372	35,080
DEAL_INTENSITY	0.215 (0.169)	0.158	42,251	0.259$^{\$\$}$ (0.214)$^{\$\$}$	0.169	7,171	0.206 (0.169)	0.154	35,080
DEAL_WAVE	0.255	0.436	42,251	0.361$^{\$\$}$	0.480	7,171	0.233	0.423	35,080

Table A3: Alternative sample-selection models for acquirer cumulative abnormal returns

This table presents alternative sample-selection models for acquirer cumulative abnormal returns (CARs) for the sample of acquisitions and firms described in Table 1. Sample-selection models are the same as those in Table 5 except for the following changes. In Panel A, ln(SIZE) (market value) and ln(SIZE_MEDIAN) (market value) are replaced with ln(SIZE) (book value) and ln(SIZE_MEDIAN) (book value) respectively. Inverse Mills ratios are from a corresponding probit regression the same as that in Table 4 except for this variable replacement. SIZE (book value) and SIZE_MEDIAN (book value) are defined in Table A1 of the Appendix. In Panel B, acquirer CARs are continuously compounded market-adjusted returns for the three trading days centred on the acquisition announcement date. In Panel C, Inverse Mills ratios are from a corresponding probit regression the same as that in Table 4 except that the probit regression for serial acquirers (non-serial acquirers) does not pool firms in the same acquisition announcement year that are non-serial acquirers (serial acquirers) with non-acquirers. In Panel D, bootstrapping of standard errors is replaced with Heckman maximum-likelihood estimates. For reasons of brevity only selected acquirer and deal characteristics (and no constant) are displayed in each Panel. **, * indicate statistical significance of coefficients and Wald statistics at the one- and five-percent levels respectively.

Panel A: SIZE (book value)

	Acquirer CARs					
	Serial deals		**Non-serial deals**		**All deals**	
Acquirer and deal characteristics	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**
Inverse Mills ratio	0.0019	(0.0065)	0.1809**	(0.0546)	0.0298*	(0.0128)
BLOCK_DEAL	-0.0012	(0.0016)				
SERIAL_DEAL					-0.0094**	(0.0021)
ln(SIZE) (book value)	-0.0039**	(0.0009)	-0.0024	(0.0024)	-0.0021	(0.0014)
Wald statistic	198.1**		139.5**		279.6**	
Adjusted-R^2	3.2		6.4		4.8	
No. of observations	5,465		2,124		7,589	

Panel B: Market-adjusted CARs

	Acquirer CARs					
	Serial deals		**Non-serial deals**		**All deals**	
Acquirer and deal characteristics	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**
Inverse Mills ratio	-0.0009	(0.0067)	0.1915**	(0.0544)	0.0287*	(0.0130)
BLOCK_DEAL	0.0004	(0.0016)				
SERIAL_DEAL					-0.0083**	(0.0021)
ln(SIZE) (market value)	-0.0045**	(0.0009)	-0.0021	(0.0023)	-0.0023	(0.0013)
Wald statistic	206.1**		155.3**		262.0**	
Adjusted-R^2	3.1		7.0		3.8	
No. of observations	5,465		2,124		7,589	

Table A3 (cont.): Alternative sample-selection models for acquirer cumulative abnormal returns

Panel C: Inverse Mills ratios without pooling				
	Acquirer CARs			
Acquirer and deal characteristics	Serial deals		Non-serial deals	
	Coefficient	Standard error	Coefficient	Standard error
Inverse Mills ratio	0.0004	(0.0066)	0.1635**	(0.0472)
BLOCK_DEAL	-0.0011	(0.0016)		
ln(SIZE) (market value)	-0.0042**	(0.0009)	-0.0002	(0.0025)
Wald statistic	197.6**		157.7**	
Adjusted-R^2	3.3		7.0	
No. of observations	5,465		2,124	

Panel D: Heckman estimates		
	Acquirer CARs	
	Non-serial deals	
Acquirer and deal characteristics	Coefficient	Standard error
Inverse Mills ratio	0.1992**	(0.0668)
ln(SIZE) (market value)	-0.0029	(0.0026)
Wald statistic	123.4**	
No. of observations	2,124	

Table 1: Sample of acquisitions and firms

This table presents the sample of acquisitions and firms by showing the annual frequency, aggregate size, and intensity of acquisitions announced by UK listed firms during the period 1989-2014. Acquisitions are from the SDC Platinum database and comprised of domestic and cross-border deals for public, private, and subsidiary firms that involve the purchase of at least 50 percent of the share capital and end in outright ownership. Deals with a size (deal value times $\frac{1}{1 - \text{toehold}}$, where toehold is the percentage of the share capital of the firm being acquired that is already owned by the acquirer) less than one million dollars in real (2014) terms, deals with a size of less than one percent of the market value of the acquirer (where the market value of the acquirer is the market value of equity minus book value of equity plus book value of total assets for the fiscal period end before the acquisition announcement year), and acquisitions by or for firms in financial and utility industies are excluded. Acquisitions are merged with the annual population of listed firms reconstructed from live and dead constituents of the Datastream database after excluding financials and utilities. Serial deals follow in the preceding three years at least one other acquisition (meeting criteria as for the sample acquisitions) with the same acquirer Datastream code. Non-serial deals are the remaining deals. Firms can do (multiple) serial deals and non-serial deals in the same acquisition announcement year. Firm size is the market value of equity minus book value of equity plus book value of total assets for the fiscal period end before the acquisition announcement year. Aggregate size of deals and firms are in trillion dollar units and real terms. Deal intensity is the total number of deals divided by number of firms and multiplied by aggregate size of all deals divided by aggregate size of firms.

Acquisition announcement year	No. of serial deals	No. of serial acquirers	Aggregate size of serial deals	No. of non-serial deals/ acquirers	Aggregate size of non-serial deals	Total no. of deals	Total no. of acquirers	Aggregate size of all deals	No. of firms	Aggregate size of firms	Deal intensity
1989	156	81	6.7	332	32.5	488	324	39.2	1,128	2,745.2	0.618
1990	229	137	18.3	171	20.2	400	278	38.5	1,153	3,179.4	0.421
1991	179	114	20.5	93	7.8	272	194	28.3	1,161	2,791.8	0.238
1992	188	115	18.1	83	7.2	271	184	25.3	1,169	3,668.9	0.160
1993	213	138	13.4	120	3.8	333	242	17.2	1,248	3,812.2	0.120
1994	275	175	14.3	131	13.0	406	279	27.4	1,338	3,754.2	0.221
1995	271	172	27.7	127	8.0	398	283	35.6	1,465	3,896.1	0.248
1996	305	196	9.7	161	14.2	466	334	23.9	1,624	4,265.1	0.161
1997	441	253	34.5	203	16.5	644	418	51.0	1,730	4,553.9	0.417
1998	500	288	31.9	190	21.4	690	444	53.4	1,762	5,135.5	0.407
1999	486	297	66.5	156	22.3	642	414	88.8	1,726	5,293.6	0.624
2000	483	282	43.2	178	17.8	661	429	61.0	1,797	5,643.8	0.398
2001	334	217	34.8	138	9.0	472	336	43.7	1,765	5,548.0	0.211
2002	245	164	39.5	111	15.1	356	262	54.6	1,760	5,165.9	0.214

Table 1 (cont.): Sample of acquisitions and firms

Acquisition announcement year	No. of serial deals	No. of serial acquirers	Aggregate size of serial deals	No. of non-serial deals/ acquirers	Aggregate size of non-serial deals	Total no. of deals	Total no. of acquirers	Aggregate size of all deals	No. of firms	Aggregate size of firms	Deal intensity
2003	199	130	33.2	89	7.0	288	209	40.1	1,736	4,841.6	0.138
2004	260	169	41.3	123	6.8	383	266	48.1	1,837	5,195.8	0.193
2005	284	170	39.5	189	14.2	473	331	53.7	2,040	5,505.9	0.226
2006	333	212	26.7	180	19.2	513	360	46.0	2,114	6,593.8	0.169
2007	403	239	32.9	131	6.7	534	346	39.6	2,100	6,591.8	0.153
2008	222	144	20.1	86	10.7	308	219	30.8	1,982	7,386.8	0.065
2009	120	81	12.1	60	3.8	180	135	16.0	1,789	7,098.8	0.023
2010	165	99	24.9	87	9.8	252	175	34.7	1,658	5,581.4	0.095
2011	146	92	15.0	102	19.5	248	184	34.5	1,580	6,355.6	0.085
2012	132	89	13.5	72	3.1	204	155	16.6	1,532	6,229.8	0.036
2013	153	97	13.8	82	3.4	235	171	17.3	1,517	6,305.5	0.042
2014	173	114	10.5	94	10.8	267	199	21.2	1,540	6,554.4	0.056
Total	6,895	4,265	662.6	3,489	324.0	10,384	7,171	986.6	42,251	133,694.3	0.181

Table 2: Descriptive statistics for acquirer and deal characteristics

This table presents descriptive statistics for acquirer and deal characteristics for the sample of acquisitions and firms described in Table 1. Descriptive statistics are at the level of the deal. Acquirer and deal characteristics are defined in Table A1 of the Appendix. $^{\$\$, \$}$ indicate statistical significance of mean (median) differences in acquirer and deal characteristics between serial deals and non-serial deals at the one- and five-percent levels respectively.

	Serial deals			Non-serial deals			All deals		
Acquirer and deal characteristics	**Mean (Median)**	**Standard deviation**	**No. of observations**	**Mean (Median)**	**Standard deviation**	**No. of observations**	**Mean (Median)**	**Standard deviation**	**No. of observations**
CAR	0.007$^{\$\$}$	0.058	6,501	0.018	0.112	2,953	0.010	0.079	9,454
	(0.002)			(0.003)			(0.003)		
SIZE (market value)	8,561.9$^{\$\$}$	32,354.7	6,433	5,946.0	27,115.3	2,818	7,765.1	30,875.1	9,251
	(806.4)$^{\$\$}$			(237.6)			(596.1)		
SIZE (book value)	4,252.0$^{\$}$	17,596.4	6,518	3,320.9	15,303.6	3,002	3,958.4	16,911.7	9,520
	(382.3)$^{\$\$}$			(128.4)			(286.8)		
AGE	17.9$^{\$\$}$	13.2	6,849	13.8	12.4	3,453	16.6	13.1	10,302
	(14.0)$^{\$}$			(9.0)			(12.0)		
AGE_MAXIMUM	0.003	0.055	6,895	0.002	0.048	3,489	0.003	0.053	10,384
Q_RATIO	2.067	1.770	6,433	2.079	2.071	2,818	2.070	1.867	9,251
	(1.586)$^{\$\$}$			(1.447)			(1.546)		
Q_RATIO	0.452	1.801	6,433	0.520	2.092	2,818	0.473	1.894	9,251
(industry-adjusted)	(0.073)$^{\$\$}$			(-0.021)			(0.042)		
SALES_GROWTH	0.553$^{\$\$}$	1.676	6,209	0.412	1.469	2,637	0.511	1.619	8,846
	(0.182)$^{\$\$}$			(0.119)			(0.165)		
SALES_GROWTH	0.405$^{\$\$}$	1.674	6,209	0.251	1.464	2,637	0.359	1.616	8,846
(industry-adjusted)	(0.046)$^{\$\$}$			(-0.026)			(0.025)		
ROA	0.084$^{\$\$}$	0.151	6,493	0.031	0.235	2,959	0.067	0.183	9,452
	(0.097)$^{\$\$}$			(0.083)			(0.093)		
ROA (industry-adjusted)	0.016$^{\$\$}$	0.155	6,493	-0.039	0.236	2,959	-0.001	0.186	9,452
	(0.021)$^{\$\$}$			(0.001)			(0.016)		
ROA_VOLATILITY	0.073$^{\$\$}$	0.179	5,840	0.113	0.248	2,389	0.085	0.202	8,229
	(0.025)$^{\$\$}$			(0.034)			(0.027)		

Table 2 (cont.): Descriptive statistics for acquirer and deal characteristics

	Serial deals			Non-serial deals			All deals		
Acquirer and deal characteristics	**Mean (Median)**	**Standard deviation**	**No. of observations**	**Mean (Median)**	**Standard deviation**	**No. of observations**	**Mean (Median)**	**Standard deviation**	**No. of observations**
ROA_VOLATILITY (industry-adjusted)	0.030$^{\$\$}$ (-0.009)$^{\$\$}$	0.180	5,840	0.071 (0.000)	0.247	2,389	0.041 (-0.007)	0.202	8,229
LEVERAGE_RATIO	0.202$^{\$\$}$ (0.177)$^{\$\$}$	0.165	6,514	0.176 (0.131)	0.183	3,000	0.194 (0.164)	0.171	9,514
LEVERAGE_RATIO (industry-adjusted)	0.052$^{\$\$}$ (0.023)$^{\$\$}$	0.174	6,514	0.026 (-0.015)	0.190	3,000	0.043 (0.014)	0.180	9,514
LIQUIDITY_RATIO	0.125$^{\$\$}$ (0.082)$^{\$\$}$	0.138	6,389	0.175 (0.093)	0.208	2,931	0.141 (0.085)	0.165	9,320
LIQUIDITY_RATIO (industry-adjusted)	0.028 (-0.004)	0.148	6,389	0.082 (0.012)	0.213	2,931	0.045 (0.000)	0.173	9,320
DEAL_SIZE	101.4 (16.6)$^{\$\$}$	325.9	6,895	100.9 (14.3)	332.1	3,489	101.2 (15.7)	327.9	10,384
RELATIVE_SIZE	0.107$^{\$\$}$ (0.027)$^{\$\$}$	0.268	6,433	0.230 (0.067)	0.446	2,818	0.145 (0.035)	0.337	9,251
PUBLIC_DEAL	0.061$^{\$\$}$	0.239	6,895	0.092	0.289	3,489	0.071	0.258	10,384
PRIVATE_DEAL	0.601$^{\$\$}$	0.490	6,895	0.569	0.495	3,489	0.590	0.492	10,384
SUBSIDIARY_DEAL	0.338	0.473	6,895	0.339	0.474	3,489	0.338	0.473	10,384
STOCK_DEAL	0.292$^{\$\$}$	0.455	6,895	0.333	0.471	3,489	0.306	0.461	10,384
CASH_DEAL	0.482$^{\$\$}$	0.500	6,895	0.394	0.489	3,489	0.453	0.498	10,384
MIXED_DEAL	0.147$^{\$\$}$	0.355	6,895	0.174	0.379	3,489	0.156	0.363	10,384
DIVERSIFYING_DEAL	0.515	0.500	6,895	0.503	0.500	3,489	0.511	0.500	10,384
CROSSBORDER_DEAL	0.330$^{\$\$}$	0.470	6,895	0.273	0.445	3,489	0.311	0.463	10,384
UNSOLICITED_DEAL	0.003$^{\$}$	0.051	6,895	0.005	0.072	3,489	0.003	0.059	10,384
RIVAL_DEAL	0.006	0.074	6,895	0.005	0.074	3,489	0.005	0.074	10,384

Table 3: Linear regressions for acquirer cumulative abnormal returns

This table presents linear regressions for acquirer cumulative abnormal returns (CARs) for the sample of acquisitions and firms described in Table 1. Linear regressions are at the level of the deal. Acquirer CARs and other acquirer and deal characteristics are defined in Table A1 of the Appendix. Linear regressions include Industry Classification Benchmark super-sectors and acquisition announcement years. Standard errors are bootstrapped (with 2,000 replications) and clustered at the level of the acquirer. **, * indicate statistical significance of coefficients and Wald statistics at the one- and five-percent levels respectively.

	Acquirer CARs					
	Serial deals		**Non-serial deals**		**All deals**	
Acquirer and deal characteristics	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**
BLOCK_DEAL	-0.0011	(0.0015)				
SERIAL_DEAL					-0.0093**	(0.0021)
ln(SIZE) (market value)	-0.0042**	(0.0007)	-0.0051*	(0.0021)	-0.0043**	(0.0009)
AGE	0.0001	(0.0001)	0.0003	(0.0002)	0.0002*	(0.0001)
AGE_MAXIMUM	0.0014	(0.0091)	-0.0300	(0.0212)	-0.0050	(0.0087)
Q_RATIO (industry-adjusted)	0.0002	(0.0010)	0.0024	(0.0038)	0.0014	(0.0015)
SALES_GROWTH (industry-adjusted)	-0.0018	(0.0012)	0.0005	(0.0021)	-0.0015	(0.0011)
ROA (industry-adjusted)	0.0057	(0.0133)	-0.0405	(0.0243)	-0.0181	(0.0149)
ROA_VOLATILITY (industry-adjusted)	-0.0037	(0.0055)	-0.0189	(0.0230)	-0.0069	(0.0086)
LEVERAGE_RATIO (industry-adjusted)	-0.0067	(0.0057)	0.0097	(0.0180)	-0.0026	(0.0069)
LIQUIDITY_RATIO (industry-adjusted)	-0.0065	(0.0068)	-0.0369	(0.0190)	-0.0163	(0.0083)
ln(DEAL_SIZE)	0.0035**	(0.0008)	0.0019	(0.0020)	0.0028**	(0.0008)
RELATIVE_SIZE	-0.0128*	(0.0059)	0.0263	(0.0191)	0.0087	(0.0103)
PRIVATE_DEAL	0.0215**	(0.0043)	0.0261**	(0.0072)	0.0248**	(0.0042)
SUBSIDIARY_DEAL	0.0251**	(0.0042)	0.0195**	(0.0074)	0.0252**	(0.0041)
CASH_DEAL	0.0005	(0.0015)	0.0021	(0.0044)	0.0007	(0.0017)
MIXED_DEAL	0.0001	(0.0026)	0.0088	(0.0100)	0.0018	(0.0036)
DIVERSIFYING_DEAL	0.0009	(0.0014)	0.0021	(0.0042)	0.0014	(0.0015)
CROSSBORDER_DEAL	0.0010	(0.0017)	0.0041	(0.0046)	0.0021	(0.0018)
UNSOLICITED_DEAL	-0.0400	(0.0211)	-0.0073	(0.0145)	-0.0279*	(0.0123)
RIVAL_DEAL	-0.0075	(0.0104)	-0.0013	(0.0181)	-0.0068	(0.0084)
Constant	-0.0044	(0.0084)	-0.0106	(0.0187)	-0.0060	(0.0021)
Wald statistic	204.5**		148.3**		276.9**	
Adjusted-R^2	3.4		5.9		3.9	
No. of observations	5,465		2,124		7,589	

Table 4: Probit regressions for acquisition likelihood

This table presents probit regressions for acquisition likelihood for the sample of acquisitions and firms described in Table 1. Probit regressions are at the level of the firm and acquisition announcement year. Acquisition likelihood is a binary variable equal to one for a firm that is an acquirer in the acquisition announcement year. The probit regression for serial acquirers (non-serial acquirers) pools firms in the same acquisition announcement year that are non-serial acquirers (serial acquirers) with non-acquirers. Firm and environment characteristics are defined in Table A1 of the Appendix. Standard errors are bootstrapped (with 2,000 replications) and clustered at the level of the firm. **, * indicate statistical significance of average marginal effects and Wald statistics at the one- and five-percent levels respectively. $^{\$\$, \$}$ indicate statistical significance of average marginal effect differences in firm and environment characteristics between serial acquirers and non-serial acquirers at the one- and five-percent levels respectively.

	Acquisition likelihood					
	Serial acquirers		**Non-serial acquirers**		**All acquirers**	
Firm and environment characteristics	**Average marginal effect**	**Standard error**	**Average marginal effect**	**Standard error**	**Average marginal effect**	**Standard error**
ln(SIZE) (market value)	0.0255**$^{,\$\$}$	(0.0020)	0.0020**	(0.0007)	0.0273**	(0.0021)
AGE	0.0002	(0.0003)	-0.0003	(0.0001)	0.0000	(0.0004)
AGE_MAXIMUM	-0.0010	(0.0125)	0.0174**	(0.0045)	0.0149	(0.0139)
Q_RATIO (industry-adjusted)	0.0029	(0.0018)	0.0011	(0.0009)	0.0045*	(0.0019)
SALES_GROWTH (industry-adjusted)	0.0077**$^{,\$\$}$	(0.0014)	-0.0025	(0.0013)	0.0047**	(0.0017)
ROA (industry-adjusted)	0.0966**$^{,\$\$}$	(0.0179)	0.0259**	(0.0062)	0.0936**	(0.0140)
ROA_VOLATILITY (industry-adjusted)	0.0024	(0.0097)	0.0100*	(0.0046)	0.0185*	(0.0093)
LEVERAGE_RATIO (industry-adjusted)	-0.0798**$^{,\$}$	(0.0169)	-0.0272**	(0.0081)	-0.1018**	(0.0177)
LIQUIDITY_RATIO (industry-adjusted)	-0.0859**$^{,\$\$}$	(0.0197)	0.0402**	(0.0090)	-0.0244	(0.0191)
ln(SIZE_MEDIAN) (market value)	-0.0015	(0.0044)	0.0023	(0.0017)	-0.0015	(0.0047)
AGE_MEDIAN	0.0023**	(0.0008)	0.0006	(0.0004)	0.0027**	(0.0009)
AGE_DISPERSION	0.2006**$^{,\$\$}$	(0.0434)	0.0125	(0.0216)	0.2003**	(0.0472)
CONCENTRATION	-0.1765**$^{,\$\$}$	(0.0342)	-0.0104	(0.0111)	-0.1673**	(0.0321)
INDUSTRY_DURATION	0.0000	(0.0000)	0.0000*	(0.0000)	0.0000	(0.0000)
INDUSTRY_WAVE	0.0348**$^{,\$\$}$	(0.0061)	0.0020	(0.0043)	0.0384**	(0.0071)
DEAL_WAVE	0.0410**	(0.0054)	0.0297	(0.0035)	0.0671**	(0.0062)
Constant	0.1238**$^{,\$\$}$	(0.0035)	0.0686**	(0.0013)	0.1892**	(0.0037)
Wald statistic	599.1**		275.7**		740.3**	
Pseudo-R^2	7.7		1.6		5.6	
No. of observations	28,633		28,633		28,633	

Table 5: Sample-selection models for acquirer cumulative abnormal returns

This table presents sample-selection models for acquirer cumulative abnormal returns (CARs) for the sample of acquisitions and firms described in Table 1. Sample-selection models are at the level of the deal. Inverse Mills ratios for the acquisition announcement year are from the corresponding probit regression in Table 4. Acquirer CARs and other acquirer and deal characteristics are defined in Table A1 of the Appendix. Sample-selection models include Industry Classification Benchmark super-sectors and acquisition announcement years. Standard errors are bootstrapped (with 2,000 replications) and clustered at the level of the acquirer. **, * indicate statistical significance of coefficients and Wald statistics at the one- and five-percent levels respectively.

	Acquirer CARs					
	Serial deals		**Non-serial deals**		**All deals**	
Acquirer and deal characteristics	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**
Inverse Mills ratio	0.0001	(0.0067)	0.1849**	(0.0547)	0.0303*	(0.0126)
BLOCK_DEAL	-0.0011	(0.0016)				
SERIAL_DEAL					-0.0090**	(0.0021)
ln(SIZE) (market value)	-0.0042**	(0.0009)	-0.0019	(0.0022)	-0.0020	(0.0013)
AGE	0.0001	(0.0001)	0.0004*	(0.0002)	0.0002*	(0.0001)
AGE_MAXIMUM	0.0014	(0.0092)	-0.0277	(0.0222)	-0.0051	(0.0084)
Q_RATIO (industry-adjusted)	0.0002	(0.0010)	0.0025	(0.0039)	0.0017	(0.0015)
SALES_GROWTH (industry-adjusted)	-0.0018	(0.0012)	-0.0025	(0.0022)	-0.0011	(0.0011)
ROA (industry-adjusted)	0.0057	(0.0125)	-0.0026	(0.0198)	-0.0061	(0.0129)
ROA_VOLATILITY (industry-adjusted)	-0.0037	(0.0054)	-0.0015	(0.0212)	-0.0045	(0.0080)
LEVERAGE_RATIO (industry-adjusted)	-0.0067	(0.0058)	-0.0140	(0.0169)	-0.0106	(0.0070)
LIQUIDITY_RATIO (industry-adjusted)	-0.0066	(0.0070)	0.0080	(0.0190)	-0.0194*	(0.0084)
ln(DEAL_SIZE)	0.0035**	(0.0008)	0.0021	(0.0019)	0.0029**	(0.0008)
RELATIVE_SIZE	-0.0128*	(0.0058)	0.0267	(0.0189)	0.0079	(0.0102)
PRIVATE_DEAL	0.0215**	(0.0044)	0.0266**	(0.0075)	0.0252**	(0.0041)
SUBSIDIARY_DEAL	0.0251**	(0.0043)	0.0203**	(0.0076)	0.0255**	(0.0040)
CASH_DEAL	0.0005	(0.0015)	0.0017	(0.0044)	0.0007	(0.0016)
MIXED_DEAL	0.0001	(0.0026)	0.0086	(0.0097)	0.0019	(0.0037)
DIVERSIFYING_DEAL	0.0009	(0.0014)	0.0032	(0.0043)	0.0017	(0.0016)
CROSSBORDER_DEAL	0.0010	(0.0017)	0.0012	(0.0047)	0.0019	(0.0018)
UNSOLICITED_DEAL	-0.0400	(0.0205)	-0.0059	(0.0140)	-0.0288*	(0.0118)
RIVAL_DEAL	-0.0075	(0.0103)	-0.0085	(0.0179)	-0.0073	(0.0086)
Constant	-0.0047	(0.0165)	-0.3449**	(0.1048)	-0.0574*	(0.0242)
Wald statistic	209.2**		144.9**		283.8**	
Adjusted-R^2	3.3		7.0		4.1	
No. of observations	5,465		2,124		7,589	

Table 6: Probit regressions for block and non-block serial-acquisition likelihood

This table presents probit regressions for block and non-block serial-acquisition likelihood for the sample of acquisitions and firms described in Table 1. Probit regressions are at the level of the firm and acquisition announcement year. Block (non-block) serial-acquisition likelihood is a binary variable equal to one for a firm that is a block acquirer (non-block acquirer) in the acquisition announcement year. The probit regression for block acquirers (non-block acquirers) pools firms in the same acquisition announcement year that are non-block acquirers (block acquirers) and non-serial acquirers with non-acquirers. Block deals follow in the preceding year at least one other acquisition in the SDC Platinum database (meeting criteria as for the sample acquisitions) with the same acquirer Datastream database code. Non-block deals are the remaining serial deals. Firms can do (multiple) block deals and non-block deals in the same acquisition announcement year. Block deals (acquirers) number 4,877 (2,408) and non-block deals (acquirers) number 2,018 (1,857). Firm and environment characteristics are defined in Table A1 of the Appendix. Standard errors are bootstrapped (with 2,000 replications) and clustered at the level of the firm. **, * indicate statistical significance of average marginal effects and Wald statistics at the one- and five-percent levels respectively. $$, $ indicate statistical significance of average marginal effect differences in firm and environment characteristics between block acquirers and non-block acquirers at the one- and five-percent levels respectively.

	Block and non-block serial-acquisition likelihood			
	Block acquirers		**Non-block acquirers**	
Firm and environment characteristics	**Average marginal effect**	**Standard error**	**Average marginal effect**	**Standard error**
ln(SIZE) (market value)	0.0147**	(0.0014)	0.0111**	(0.0010)
AGE	0.0002	(0.0002)	0.0001	(0.0002)
AGE_MAXIMUM	-0.0056	(0.0086)	0.0039	(0.0061)
Q_RATIO (industry-adjusted)	0.0037**,$$	(0.0012)	-0.0014	(0.0011)
SALES_GROWTH (industry-adjusted)	0.0051**	(0.0011)	0.0025**	(0.0009)
ROA (industry-adjusted)	0.0701**	(0.0143)	0.0375**	(0.0109)
ROA_VOLATILITY (industry-adjusted)	0.0002	(0.0076)	0.0019	(0.0058)
LEVERAGE_RATIO (industry-adjusted)	-0.0336**	(0.0121)	-0.0472**	(0.0094)
LIQUIDITY_RATIO (industry-adjusted)	-0.0545**	(0.0145)	-0.0347**	(0.0117)
ln(SIZE_MEDIAN) (market value)	-0.0018	(0.0031)	0.0004	(0.0024)
AGE_MEDIAN	0.0016**	(0.0006)	0.0008	(0.0005)
AGE_DISPERSION	0.1366**	(0.0315)	0.0712**	(0.0258)
CONCENTRATION	-0.1339**,$$	(0.0246)	-0.0579**	(0.0178)
INDUSTRY_DURATION	0.0000	(0.0000)	0.0000	(0.0000)
INDUSTRY_WAVE	0.0207**	(0.0044)	0.0133**	(0.0042)
DEAL_WAVE	0.0263**	(0.0042)	0.0165**	(0.0037)
Constant	0.0680**	(0.0024	0.0577**	(0.0018)
Wald statistic	470.4**		382.4**	
Pseudo-R^2	7.3		4.6	
No. of observations	28,633		28,633	

Table 7: Linear regressions and sample-selection models for block and non-block serial-acquirer cumulative abnormal returns

This table presents linear regressions and sample-selection models for block and non-block serial-acquirer cumulative abnormal returns (CARs) for the sample of acquisitions and firms described in Table 1. Linear regressions and sample-selection models are at the level of the deal. Inverse Mills ratios for the acquisition announcement year are from the corresponding probit regression in Table 6. Block and non-block serial acquirers and deals are described in Table 6 and acquirer CARs and other acquirer and deal characteristics are defined in Table A1 of the Appendix. Linear regressions and sample-selection models include Industry Classification Benchmark super-sectors and acquisition announcement years. Standard errors are bootstrapped (with 2,000 replications) and clustered at the level of the acquirer. **, * indicate statistical significance of coefficients and Wald statistics at the one- and five-percent levels respectively.

	Block and non-block serial-acquirer CARs							
	Linear regressions				**Sample-selection models**			
	Block deals		**Non-block deals**		**Block deals**		**Non-block deals**	
Acquirer and deal characteristics	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**
Inverse Mills ratio					0.0029	(0.0065)	-0.0049	(0.0187)
ln(SIZE) (market value)	-0.0038**	(0.0008)	-0.0049**	(0.0013)	-0.0036**	(0.0009)	-0.0053**	(0.0020)
AGE	0.0000	(0.0001)	0.0001	(0.0001)	0.0000	(0.0001)	0.0001	(0.0001)
AGE_MAXIMUM	-0.0021	(0.0106)	0.0045	(0.0149)	-0.0021	(0.0105)	0.0048	(0.0155)
Q_RATIO (industry-adjusted)	0.0004	(0.0012)	-0.0010	(0.0014)	0.0004	(0.0013)	-0.0010	(0.0014)
SALES_GROWTH (industry-adjusted)	-0.0014	(0.0013)	-0.0031	(0.0028)	-0.0013	(0.0014)	-0.0032	(0.0027)
ROA (industry-adjusted)	0.0067	(0.0182)	0.0023	(0.0135)	0.0087	(0.0181)	0.0007	(0.0142)
ROA_VOLATILITY (industry-adjusted)	-0.0080	(0.0071)	0.0063	(0.0104)	-0.0080	(0.0072)	0.0062	(0.0106)
LEVERAGE_RATIO (industry-adjusted)	-0.0073	(0.0068)	-0.0034	(0.0101)	-0.0080	(0.0072)	-0.0018	(0.0118)
LIQUIDITY_RATIO (industry-adjusted)	-0.0057	(0.0081)	-0.0076	(0.0128)	-0.0069	(0.0082)	-0.0062	(0.0136)
ln(DEAL_SIZE)	0.0041**	(0.0009)	0.0026*	(0.0012)	0.0041**	(0.0009)	0.0026*	(0.0012)
RELATIVE_SIZE	-0.0126	(0.0078)	-0.0117	(0.0086)	-0.0127	(0.0079)	-0.0115	(0.0087)
PRIVATE_DEAL	0.0218**	(0.0056)	0.0215**	(0.0072)	0.0219**	(0.0055)	0.0215**	(0.0071)

Table 7 (cont.): Linear regressions and sample-selection models for block and non-block serial-acquirer cumulative abnormal returns

	Block and non-block serial-acquirer CARs							
	Linear regressions				**Sample-selection models**			
	Block deals		**Non-block deals**		**Block deals**		**Non-block deals**	
Acquirer and deal characteristics	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**
SUBSIDIARY_DEAL	0.0258**	(0.0056)	0.0243**	(0.0072)	0.0258**	(0.0056)	0.0243**	(0.0072)
CASH_DEAL	0.0019	(0.0018)	-0.0019	(0.0030)	0.0020	(0.0018)	-0.0019	(0.0029)
MIXED_DEAL	0.0018	(0.0031)	-0.0045	(0.0050)	0.0019	(0.0031)	-0.0044	(0.0050)
DIVERSIFYING_DEAL	0.0003	(0.0016)	0.0024	(0.0028)	0.0003	(0.0017)	0.0024	(0.0029)
CROSSBORDER_DEAL	-0.0009	(0.0020)	0.0044	(0.0031)	-0.0009	(0.0020)	0.0044	(0.0030)
UNSOLICITED_DEAL	-0.0522	(0.0290)	-0.0113	(0.0191)	-0.0522	(0.0282)	-0.0111	(0.0191)
RIVAL_DEAL	-0.0071	(0.0099)	-0.0110	(0.0226)	-0.0071	(0.0096)	-0.0109	(0.0224)
Constant	-0.0075**	(0.0103)	-0.0096	(0.0146)	-0.0144	(0.0184)	0.0021	(0.0486)
Wald statistic	167.7**		126.8**		157.4**		129.1**	
Adjusted-R^2	2.7		4.4		2.7		4.3	
No. of observations	3,719		1,746		3,719		1,746	

Table 8: Linear regression and sample-selection model for serial-acquirer cumulative abnormal returns with fixed effects for deals by the same firm

This table presents a linear regression and sample-selection model for serial-acquirer cumulative abnormal returns (CARs) with fixed effects for deals by the same firm for the sample of acquisitions and firms described in Table 1. The linear regression and sample-selection model are at the level of the deal. Inverse Mills ratios for the acquisition announcement year are from the probit regression for serial acquirers in Table 4. Acquirer CARs and other acquirer and deal characteristics are defined in Table A1 of the Appendix. The linear regression and sample-selection model also include Industry Classification Benchmark super-sectors and acquisition announcement years. **, * indicate statistical significance of coefficients and F-statistics at the one- and five-percent levels respectively.

	Serial-acquirer CARs			
Acquirer and deal characteristics	**Linear regression**		**Sample-selection model**	
	Coefficient	**Standard error**	**Coefficient**	**Standard error**
Inverse Mills ratio			-0.0107	(0.0170)
BLOCK_DEAL	-0.0013	(0.0018)	-0.0013	(0.0018)
ln(SIZE) (market value)	-0.0069**	(0.0026)	-0.0082**	(0.0029)
AGE	0.0006	(0.0004)	0.0007	(0.0004)
AGE_MAXIMUM	-0.0022	(0.0099)	-0.0020	(0.0098)
Q_RATIO (industry-adjusted)	0.0029	(0.0016)	0.0028	(0.0016)
SALES_GROWTH (industry-adjusted)	-0.0008	(0.0022)	-0.0012	(0.0023)
ROA (industry-adjusted)	-0.0202	(0.0217)	-0.0250	(0.0204)
ROA_VOLATILITY (industry-adjusted)	0.0097	(0.0118)	0.0086	(0.0117)
LEVERAGE_RATIO (industry-adjusted)	0.0060	(0.0148)	0.0098	(0.0141)
LIQUIDITY_RATIO (industry-adjusted)	-0.0165	(0.0124)	-0.0133	(0.0129)
ln(DEAL_SIZE)	0.0033**	(0.0010)	0.0033**	(0.0010)
RELATIVE_SIZE	-0.0118	(0.0087)	-0.0117	(0.0087)
PRIVATE_DEAL	0.0241**	(0.0050)	0.0241**	(0.0050)
SUBSIDIARY_DEAL	0.0282**	(0.0051)	0.0282**	(0.0051)
CASH_DEAL	0.0014	(0.0019)	0.0014	(0.0019)
MIXED_DEAL	0.0022	(0.0034)	0.0022	(0.0034)
DIVERSIFYING_DEAL	0.0030	(0.0019)	0.0030	(0.0019)
CROSSBORDER_DEAL	0.0006	(0.0020)	0.0006	(0.0020)
UNSOLICITED_DEAL	-0.0246	(0.0190)	-0.0243	(0.0191)
RIVAL_DEAL	-0.0065	(0.0133)	-0.0065	(0.0134)
Constant	-0.0143	(0.0201)	0.0110	(0.0410)
F-statistic	1.9**		1.9**	
Adjusted-R^2	17.0		17.0	
No. of observations	5,465		5,465	

Table 9: Sample-selection model with simultaneous-quartile regressions for serial-acquirer cumulative abnormal returns

This table presents a sample-selection model with simultaneous-quartile regressions for serial-acquirer cumulative abnormal returns (CARs) for the sample of acquisitions and firms described in Table 1. The sample-selection model with simultaneous-quartile regressions is at the level of the deal. Inverse Mills ratios for the acquisition announcement year are from the probit regression for serial acquirers in Table 4. Acquirer CARs and other acquirer and deal characteristics are defined in Table A1 of the Appendix. The sample-selection model with simultaneous-quartile regressions also includes Industry Classification Benchmark super-sectors and acquisition announcement years. Standard errors are bootstrapped (with 2,000 replications). **, * indicate statistical significance of coefficients at the one- and five-percent levels respectively.

Acquirer and deal characteristics	Serial-acquirer CARs					
	Lower quartile (CAR = -0.015)		Middle quartile (CAR = 0.003)		Upper quartile (CAR = 0.025)	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
Inverse Mills ratio	0.0029	(0.0049)	0.0035	(0.0035)	-0.0048	(0.0067)
ln(SIZE) (market value)	-0.0011	(0.0008)	-0.0013*	(0.0005)	-0.0045**	(0.0009)
AGE	0.0000	(0.0001)	0.0000	(0.0000)	0.0000	(0.0001)
AGE_MAXIMUM	0.0043	(0.0074)	0.0013	(0.0078)	0.0000	(0.0116)
Q_RATIO (industry-adjusted)	-0.0015*	(0.0007)	-0.0001	(0.0005)	0.0018*	(0.0009)
SALES_GROWTH (industry-adjusted)	-0.0010	(0.0012)	-0.0001	(0.0006)	0.0006	(0.0009)
ROA (industry-adjusted)	0.0133	(0.0068)	0.0078	(0.0048)	0.0017	(0.0103)
ROA_VOLATILITY (industry-adjusted)	-0.0049	(0.0053)	0.0043	(0.0040)	0.0077	(0.0062)
LEVERAGE_RATIO (industry-adjusted)	-0.0011	(0.0042)	-0.0062	(0.0032)	-0.0182**	(0.0063)
LIQUIDITY_RATIO (industry-adjusted)	-0.0019	(0.0054)	-0.0031	(0.0037)	-0.0075	(0.0078)
ln(DEAL_SIZE)	0.0005	(0.0006)	0.0019**	(0.0004)	0.0043**	(0.0007)
RELATIVE_SIZE	-0.0127	(0.0074)	-0.0024	(0.0031)	0.0016	(0.0074)
PRIVATE_DEAL	0.0204**	(0.0060)	0.0098**	(0.0029)	0.0121**	(0.0044)
SUBSIDIARY_DEAL	0.0216**	(0.0060)	0.0111**	(0.0028)	0.0134**	(0.0045)
CASH_DEAL	0.0020	(0.0013)	0.0002	(0.0010)	-0.0003	(0.0017)

Table 9 (cont.): Sample-selection model with simultaneous-quartile regressions for serial-acquirer cumulative abnormal returns

Acquirer and deal characteristics	Serial-acquirer CARs					
	Lower quartile (CAR = -0.015)		Middle quartile (CAR = 0.003)		Upper quartile (CAR = 0.025)	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
MIXED_DEAL	0.0010	(0.0022)	-0.0009	(0.0015)	-0.0001	(0.0030)
DIVERSIFYING_DEAL	0.0020	(0.0012)	0.0014	(0.0009)	-0.0003	(0.0017)
CROSSBORDER_DEAL	-0.0005	(0.0013)	0.0015	(0.0009)	0.0024	(0.0016)
UNSOLICITED_DEAL	-0.0285	(0.0398)	-0.0171	(0.0210)	-0.0419**	(0.0159)
RIVAL_DEAL	0.0018	(0.0177)	-0.0112	(0.0069)	-0.0093	(0.0127)
Constant	-0.0362**	(0.0133)	-0.0202*	(0.0093)	0.0228	(0.0167)
Pseudo-R^2	2.8		1.5		4.1	
No. of observations	2,364		2,363		2,364	